April 1, 1968

NOTES
MR. GORMAN'S COPY
4/1/68 w/ Comments

Mans notes to U. Boy
4-10-68

4/1/68 w/ comments Gorman

NOTES 4-1-68 BROWN

H-1 ENGINE Two LOX drain lines which incorporate a thermocouple boss have been fabricated to the H-1 production configuration and are being sent to MSFC and CCSD for stage checkout. It is planned to install this drain line configuration and related instrumentation on all engines for the final static test of S-IB-11. This configuration will also be installed on S-IB-5 and subsequent prior to launch, and the LOX seal drain temperature measurement will be interlocked to insure LOX seal integrity at launch commit.

F-1 ENGINE Reference my notes of 3/18/68 concerning the gas generator ball valve fuel quick disconnect bushing problem on AS-502. An Engineering Change Proposal (ECP) has been issued to replace the gas generator ball valve fuel quick disconnect bushings on AS-503 and subsequent.

The LOX valve seal leakage reported previously on AS-503, engine 4022, has not been isolated. Subsequent testing has failed to exhibit any LOX leakage. Rocketdyne is now reviewing the information from KSC and also historical data on LOX valve seals to determine if replacement of the LOX valve is required.

J-2 ENGINE Five successful S-IVB tests were conducted at AEDC on 3/27/68, including two 80-minute restart couples. The next tests consisting of two restart couples and one launch constraint reduction are scheduled for April 2.

As reported previously, tests on the first engine sample in support of reduced fuel pump inlet pressure for the S-II stage were completed on 3/20. Based on this testing Rocketdyne has submitted a model specification change which, when approved by R-P&VE, will permit operation of the J-2 engines in the S-II stage at a fuel inlet pressure of 27.0 psia. Although Rocketdyne is willing to change the model specification based on the results of the first engine sample, testing with a second engine sample to confirm the results is planned.

GENERAL The move from Neosho to Canoga Park is about 75% complete and is progressing satisfactorily. Selected supervisors, manufacturing engineers, and mechanics have been sent from Canoga to Neosho for special training as necessary. Rocketdyne will be ready to turn over the machine shop area by about April 15. All engine hardware, including eleven H-1 turbopumps now in assembly, will be shipped from Neosho by June 1, 1968. To accommodate H-1 engine testing at Santa Susana, the Canyon 3B test stand has been reactivated and ten calibration tests on two R&D engines have been conducted.

B 4/5

BALCH 4-1-68 NOTES

S-II-504 - Post-static checkout has been completed. Equipment disconnect is in process. Removal of stage from the test stand has been rescheduled from 4/6/68 to 4/4/68. ✓

S-II-505 - Pre static check is continuing on schedule. Cryogenic proof-pressure test and static firing are still scheduled for 4/16/68 and 4/26/68, respectively. ✓

S-IC-506 - "Power-up" has been postponed from 3/25/68 to 4/3/68 because of late completion of automatic checkout procedures. Stage contractor is utilizing multi-shift operations and overtime in an attempt to meet the schedule date of 4/16/68 for propellant loading. Prospects of meeting this date and the 4/30/68 schedule date for static firing are marginal. ✓

B-1 Position of S-IC Test Stand - The B-1 position of the S-IC test stand was turned over to MTF by the Corps of Engineers on 3/25/68. Currently, there are only eleven punch list items remaining, and these are scheduled for completion by 4/15/68. ✓

GE Service Contract - Evaluation of GE's performance for the period 10/2/67 through 12/31/67 has been completed by the Performance Evaluation Board. The Report of Findings prepared by the Board was forwarded to the Deputy Director, Administrative for concurrence on 3/22/68. ✓

Legal Affairs - Investigations of the C.M. Lumpkin claim for damages from the S-IC-506 static firing on 8/25/67 has been completed, and the complete file has been forwarded to the MSFC Chief Counsel's Office, with recommendation that the claim be denied. ✓

Public Affairs - Mr. Ed Delong, UPI space writer from Houston, Texas, visited MTF on 3/25/68 for general orientation. ✓

Dora Jane Hamblin, staff writer for LIFE, visited MTF on 3/26/68 in connection with a piece she is writing on the biography of a rocket (Saturn V).

Plans are being finalized for Mississippi Governor, John Bell Williams, Lieutenant Governor, Charles Sullivan, and Agricultural and Industrial Board Executive Committeemen to view the Apollo 6 launch at Kennedy Space Center. ✓

Bart Slattery

Are you in contact with her?
If not, I think you should
B

NOTES 4/1/68 BELEW

B 4/5

IBM EFFORT ON WORKSHOP ATTITUDE CONTROL SYSTEM (WACS): A meeting was held with IBM and R&DO to review the work IBM has done to date (study effort under the current IU contract) on WACS (Guidance and Control portions) and to review a scope of work against which they will submit a change proposal. This scope contemplates a significant effort by IBM (including procurement of hardware). I feel like we can "tailor" the IBM proposal to provide the effort we desire in consonance with the in-house effort. ✓

SLA/NOSE CONE JETTISON: The preliminary design analyses have been reviewed with P&VE of the SLA/NC jettison which is now assigned to MSFC. Several alternates were evaluated including: (1) 206 type NC and SLA - over the nose jettison (one piece); (2) 206 type NC and SLA - over the nose jettison of the NC and lateral jettison of the SLA panels; (3) 203 type NC and new cylindrical shroud section - over the nose jettison (one piece); and (4) Entirely new shroud (honeycomb structure) - clam shell split and lateral jettison. The problem of possible contamination from a jettison rocket for an over-the-nose jettison is being evaluated. We will continue to look at these options and baseline a plan in the near future. ✓

ATM FOLLOW-ON STUDY: New directions for the ATM Follow-on Study were discussed with Mr. Mitchell, Dr. H. Smith, and Mr. Aucremanne of OSSA on March 26, at MSFC. The MSFC approach to a Dry Workshop-ATM-B Study and a preliminary scope of work was well received by OSSA. Particular emphasis was given to the objective of "maximum maintainability" of ATM-B instruments and supporting systems. It was suggested to Mr. Mitchell that Principal Investigators should be directed now to study the in-space maintainability problems and failure modes encountered with instruments proposed for ATM-B. ✓

AAP TASK GROUPS: There are two new activities that will involve MSFC participation. The first is the Government/industry team (Martin and McDonnell Douglas) set up at Dr. Mueller's request to study the mandatory mods for the AAP CSM to be headed by MSC. We will be asking to have a representative on this group primarily in order to be in close touch with these activities. ✓ A second activity is a MSFC/MSC meeting planned for later this week to lay out a plan for studying and then implementing a revised MDA packaging and early operation of medical experiments concept. ✓ R-P&VE is already conducting a brief look at the MDA arrangements for the revised AAP core program discussed at KSC. We have received word that Dr. Floyd Thompson is very concerned that OMSF will not take a positive approach in looking at incorporating meaningful earth sensors in the AAP cluster, although OMSF agreed to consider it at the KSC meeting. ✓

Lee B

What is MSC doing in this area? B

How much can we add, weight-wise?

NOTES 4-1-68 BROWN B 4/6

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B.B. Do we conduct a few SIB static tests to verify this LOX seal drain interlock? B

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NOTES 4/1/68 CONSTAN B 4/6

The Boeing and Chrysler contract files were officially turned over to Manager, Contracts Office, MSFC, I-CO-MGR, on Thursday, March 28, 1968.

NOTES 4/1/68 EVANS B 4/6

NASA Safety Manual

It was noted in last Monday's notes that a NASA Safety Manual would be issued in the near future. Draft copies of the manual were received 3/25/68 and distributed to the appropriate Center elements for comments, information and compliance. This manual covers the whole field of safety very - very thoroughly. Some of the more salient points of the manual are outlined below:

Mac 4/8
Bernie
Please get me a copy B pronto

1. All contents of the Safety Manual carry the full force of directives.

2. Safety will be accomplished through line management responsibility with timely monitoring surveillance and staff support from the appropriate levels of safety staffs.

3. The NASA Safety Program will be action oriented as opposed to an attitude of reaction.

4. The NASA Safety Director has the authority to deal directly with all organizational levels of NASA, including the Administrator.

noted 4/8
Mac N.
Please see me on this B

5. The NASA Safety Director has the authority to stop any NASA operation for safety procedure violation or when danger is apparent.

6. Institutional Directors, Program Directors and Field Installation Directors will give consideration to empowering their safety personnel in a manner similar to that given to the NASA Safety Director by the Administrator.

7. The appropriate elements of NASA are to assure adequate guidance and surveillance of NASA contractor safety activities. Proper contract safety caluses will be used to facilitate this purpose.

8. The draft manual is to be placed in effect upon receipt.

A copy of the manual cover memo, from the NASA Safety Director, is attached for your information.

1 Enc:
As stated

NOTES 4-1-68 FELLOWS

B 9/6

Negative Report.

NOTES 4/1/68 GEISSLER B 4/6

1. Ground Wind Loads on Saturn Vehicles and Structures: On March 22, 1968, a meeting was held at KSC to discuss the following problems: (1) Deflections of the Saturn vehicle with respect to the MSS with auxiliary damper attached; (2) Vehicle bending moments (including dynamics)that establish lift-off wind limits; and (3) MSS platform redesign and operational and launch constraints due to ground wind limits. Representatives from KSC, R-AERO, R-P&VE and R-SE attended the meeting. Following action assignments resulted from the meeting: (A) MSFC will re-evaluate relative motion and determine "red line" vehicle/structural clearance values of the MSS and vehicle; (B) KSC will provide MSFC the characteristic deflections of MSS/vehicle as measured at the auxiliary damper; (C) MSFC will provide wind profile data and analysis in support of any full-scale vehicle/structure loads data acquisition, to provide data for comparison studies; (D) MSFC and KSC will jointly prepare a test plan for acquiring full-scale wind response data on AS-503 (acquisition of data will depend on 502 results); and (E) MSFC personnel will analyze and document the resulting data. We shall keep you informed on pertinent. results. ✓

2. AS-205 Operational Trajectory: MSC stated in the Guidance and Performance sub-panel meeting last week that the spacecraft weight for AS-205 is still unknown. It is estimated that the weight increase could be as high as 500 lbs additional. Based on our present performance data, that would indicate that the available reserves would be slightly less than the 3σ requirement. Spacecraft weight data should be available within two weeks. ✓

3. AS-504 Spacecraft Breakup for S-IC Single Engine Out: Recent analyses conducted on the AS-504 vehicle indicate that loads at CM-SM joint will exceed the capability as the result of a single S-IC engine out. The bending moment at this joint is approximately 30% higher than the maximum loads predicted for AS-503 ($5.3X10^6$ in-lbs for AS-503 compared to $6.9X10^6$ in-lbs for AS-504 at S/C station 1010). This bending moment increase is due to the following differences between the AS-503 and AS-504: (1) Increased payload weight (95 K for AS-503; 100 K for AS-504); (2) Increased propellant loading (255,000 pounds in S-IC and 40,000 pounds in S-II Stage); and (3) Decreased S-II stage stiffness - approximately 14%. This condition is not significantly affected by winds. Data for these analyses have been sent to MSC for more detailed structural loads studies. After these analyses by MSC, a rationale will be developed as to the course of action, since these loads are considerably above the capability for most of the S-IC stage flight. This problem is severe insofar as it will not allow warning time for EDS to allow safe abort. A letter was sent from Dr. Rudolph to Mr. Low saying MSFC will support MSC in solving this problem. A presentation on this subject was given to Dr. Rees and the Boeing TIE Task Team in Downey, by the Boeing/Huntsville people on March 29, 1968, in Downey, California.

Ernst Geissler

As a matter of general interest: Did the Boeing TIE team catch this discrepancy, or was it discovered by MSFC personnel? B

NOTES 4-1-68 GRAU

B 4/6

No submission this week.

B 4/6

NOTES 4/1/68 HAEUSSERMANN

1. ATM Clean Room Facilities. Preliminary information via telephone from NASA Headquarters indicates that an approval has been granted for the construction of the ME Laboratory's ATM clean room. An approval request for the QUAL Laboratory's clean room for ATM is in the final stages of preparation and the cost estimate is $245,000, for each clean room. ✓

2. ATM Transporter. The purchasing order approval request for the ATM transporter is now in Headquarters. IO indicates lack of funding for the transporter for FY-68 and will have to be shifted to FY-69. If a contract cannot be obtained by June 1, 1968, the transporter will not be available for the first move of the ATM prototype under controlled environmental conditions. Further resolution of this problem will be worked out with IO. ✓

3. ATM Solar Cell Modules. Thermal cycle testing of the solar cell modules from Spectrolab has caused cracking of the solder joints on the underside of the modules. An official contractual work stoppage has been initiated for future deliveries and will remain effective until this problem has been corrected. ✓

4. ATM White Light Coronagraph. A Critical Design Review of the coronagraph was held last week at Ball Brothers. The review revealed that the design was in good shape. Two main areas which were not completely reviewed were the active heater system and the incorporation of the television system. Both are in the process of having ECP's prepared and the designs will be reviewed subsequent to the formal approval of the ECP's. ✓

5. Saturn Control System. During the early part of SIVB powered flight on AS-204, the roll attitude increased to about 2.3°, whereas the nominal value of the attitude error deadband is ±1°. On the same flight, an 18 Hz structural vibration caused the roll rate gyro to generate a signal of 1.75°/sec at 18 Hz. Extensive laboratory testing has shown that the anomaly in the attitude deadband is a direct result of the structural vibration sensed by the rate gyro. These tests revealed that the attitude error deadband could increase to as high as 12° as a function of the level of the noise signal sensed by the rate gyro. To correct this condition, auxiliary propulsion system rate signal filters for pitch, yaw and roll have been designed and verified in closed loop simulations. An Engineering Change Request is being prepared for incorporation of these filters on 205, 503 manned, 504 and subsequent. ✓ It is planned that this change should not impact the launch schedules, but full impact is not presently known. ✓

NOTES 4/1/68 HEIMBURG

B 4/6

F-1 ENGINE

Test FW-079 was successfully conducted on March 27, 1968, at the West Area F-1 Test Stand for a mainstage duration of 26 seconds. This was the third of a series of seven tests required to acoustically evaluate a Saturn V IU model with a live ST 124-M installed. The IU model was moved after the first two tests in an attempt to more closely assimilate the 501 acoustic levels. Thus far, the levels have been higher than those experienced on the 501 launch, but too severe for the ST 124-M unit.

MODERATE DEPTH LUNAR DRILL

Procurement action has been initiated on specific components that were designed under the existing Northrop contract.

S-IB (MSFC)

Preparations are underway for test SA-53 scheduled for 35 seconds on April 10, 1968.

S-IVB (MSFC)

The newly designed S-IVB fuel tank pressurization diffuser assembly (502 type) was installed in the S-IVB Battleship. Six re-pressurization cycles with flight LH_2 load were conducted. After the above tests, the bag installed around the diffuser was inspected and found to be in excellent condition.

COMMAND MODULE ACCESS ARM SCHEDULE

Test Lab met with KSC representatives on March 27, 1968, to establish the Command Module Access Arm Test Schedule. They are now asking us to test all three sets. Based on a maximum test effort and assuming a completely success schedule, it appears that the Test Lab estimated schedule and the KSC need dates are compatible. Testing should start on the first access arm on May 15, 1968, and be completed on the last access arm on Dec. 1,1968.

The Boeing effort at MSFC for swing arm modification will peak at approximately 370 people in July 1968. This compares with a maximum of 75 people used by Test Lab in the Swing Arm Modification and Refurbishment Program.

B 9/6

NOTES 4-1-68 HOELZER

1.. INFORMATION STORAGE AND RETRIEVAL SYSTEMS: There are several Information Storage and Retrieval Systems in operation or in an advanced state of development at MSFC as shown by the table below.

INFORMATION OR PURPOSE	CURRENT USERS
Parts Reliability (PRINCE/APIC)	Nation-wide
Apollo Management Information Sys. (AMIRS)	NASA Hqtrs. & KSC
Test Conductor Data Mgt. Sys. (ASSIST)	QUAL
Vehicle Configuration Management Sys.	P&VE
Configuration Management Accounting & Reporting System	P&VE
AAP Experiments Cataloging	None

Efforts are being made by the Computation Laboratory to develop a generalized engineering data management system for use on the UNIVAC 1108 time-sharing computer. Such a system will allow the establishment of common data bases to avoid overlapping and duplication of data within the UNIVAC 1108. In addition, new task-oriented applications may be added to the system without reprogramming functions common to each individual system.

2. VISITORS FROM KENT STATE UNIVERSITY: Dr. Richard Vardarif and Dr. Roy Lilly of Kent State University requested information on data systems and analysis methods used at Computation Laboratory. Their purpose was to establish a system for evaluating behavioral response to induced stimuli on experiment subjects. This effort is sponsored by a National Science Foundation grant to the University.

The two scientists visited Computation Laboratory on March 25 and 26, 1968. Methods of control and acquisition for experiment data using system techniques employed at MSFC were emphasized. Discussions also included data analysis programs developed by MSFC and possible applications to behavioral experiments. The visitors were delighted to find that Fourier Analysis methods used here would save development effort for them.

NOTES 4/1/68 JOHNSON

B 4/6

Common Bulkhead Program - The final review of the contracted effort on this MSF Supporting Development Program will be presented by McDonnell Douglas Corp. on April 2, at 9:00 AM in the LIEF conference room, Building 4663. Representatives of OMSF and OART will be attending. ✓

Potential Experiments - Dr. Parnell and Mr. Fryman of EO visited Dr. Utech of the National Bureau of Standards (NBS) and Dr. McDonald of GSFC during the week of March 25. OART has expressed an interest in the NBS work on a zero g crystal growth experiment and OSSA is interested in the GSFC high energy cosmic ray experiment. Further discussions are planned on both experiments and OSSA has asked that MSFC respond to Jesse Mitchell's recent letter concerning the GSFC experiment by performing a "rough Experiment Implementation Plan" on the experiment to get some "realistic" cost figures and some integration information. ✓

OART Reprogramming Flexibility for FY 68 - To permit prompt initiation of residuals which are expected to develop rapidly during the next several weeks, we have requested OART to grant local authority to reprogram funds between and among subprograms. Historically this flexibility has been granted in late May. We have been attempting to obtain this authority earlier in the program year to expedite earlier obligation of our total resources. A response to the request is expected within a few days. ✓

B.N. Please keep me posted B

FY 69 SRT program submissions - The total OART submission will be received by Dr. Mac Adams by the submission deadline of April 1. (This is not an April Fool's joke). It is the first time in a number of years that our submission has been on time. ✓ The preparation, review, consolidation and reproduction time being compressed considerably this year, however, because of the extra effort of those involved the deadline was met. Due to the authority to obligate FY 68 funds being received very late, the FY 69 program consists primarily of continuations of on-going tasks.

The OMSF, OSSA and OTDA SRT program submissions will be forwarded to Headquarters within the next three weeks in time to meet the submission deadlines established by these Program Offices. ✓

NOTES 4-1-68 KUERS

B 4/6

1. Repair of Hydraulic Cylinder for Crawler at KSC: On request of KSC, we have accepted the job of repairing a hydraulic cylinder and its piston for Crawler No. 2 at KSC. This cylinder is 14-1/2" in diameter, about six feet long, operates on 6,000 psi, and has the function of steering the crawler. The malfunction of this cylinder, which occurred about a week ago, has not been fully analyzed; however, the cylinder and piston are badly gorged and require re-boring and sleeving of the cylinder and welding and machining a sleeve on the piston. The design and manufacturing approach of the repair have been fully coordinated with KSC. We will receive the material today and start immediately to work around-the-clock on this job. KSC will transfer funds, including those for overtime, to us. ✓

2. Status of S-II Mini-Stage Structure: The foam insulation of the bulkhead was completed last week, including some minor repairs and machining of the lower edge for assembly with the forward skirt. The skirt has been fully prepared for the assembly. The missing Huck bolts were received on Saturday, thanks to the special efforts of Mr. Buckner. We could not work on this stage on Sunday because we are running out of money for overtime. However, we are on schedule with this work. ✓

B 4/6

NOTES 4-1-68 LUCAS

1. S-II STAGE NEW MATERIAL: Because of our concern with the new MB0170-063 specification used by NR for 2014-T6 material (to be used on stages S-II-10 and subs), we initiated a joint material test program with NR. One element of the program was to investigate the stress corrosion susceptibility of the alloy because of the extremely large grain size of the material. Since we have previously established that the threshold stress for the occurrence of stress corrosion in 2014-T6 is 7 KSI, we prestressed specimens of the -063 material to 3 KSI, 5 KSI, and 10 KSI in the short transverse direction. In ten days of a required 90-day exposure, all 15 specimens stressed to 10 KSI had failed; 7 of 15 stressed at 5 KSI failed; 5 of 15 stressed at 3 KSI failed. To recheck our original data establishing 7 KSI as the threshold, we retested normal grain size 2014-T6. After 7 days of exposure of specimens stressed to 10 KSI, 5 KSI, and 3 KSI, no failures have occurred, which tends to confirm our original data. The results with the new -063 specification material indicate that because of the large grain size the threshold stress for stress corrosion is less than 3 KSI. Our testing is continuing.

B.L. On what authority (and based on what test data of their own) had NR switched to -063? I understand all material for SII 510 – 515 (in -063) is now on stock and part of it is already in parts fabrication. If we must reject -063, this would have a very major cost and schedule impact. Request a joint 2-page memo with SII Progr. Office

B

2. ORBITAL WORKSHOP (OWS): The OWS propulsion system (APS) development schedules, to which we have been committed, have slipped (day-for-day) since March 1, 1968, due to program holdup of critical component procurement action. All future working schedules will slip to reflect the elapsed time between receipt of funding go-ahead and March 1, 1968. ✓

3. ATM QUADRANT IV THERMAL VACUUM TEST: The first major test to be performed in our Sunspot I vacuum facility is assembled, and calibration runs are being made. Actual testing will begin March 29. The test article consists of two full scale, superinsulated segments of the ATM spar with the three dummy experimental components of Quadrant IV mounted thereon and covered around the periphery with a super insulated skin forming a full scale Pie-shaped quadrant. The dummy experiments contain heating elements capable of simulating the heat generated by the actual experiment. Infrared heat lamps apply heat to the insulated peripheral and end surfaces in a sequence similar to that to be experienced in orbit. Thermal transients throughout the quadrant will be studied under varying combinations of conditions of experiment usage. This test will provide vital data for the full canister Experiment Package Test to be done later this year. ✓

4. PROPOSED EVA TECHNOLOGY EXPERIMENT FOR AAP-2: At the March 12, 1968, OMSF EVA Working Group Meeting, it was pointed out that a definite gap existed in AAP-2 experiments supporting EVA technology. The present primary EVA experiments are M508, "EVA Hardware Evaluation," and M509, "Astronaut Maneuvering Equipment." A new experiment to be proposed to Headquarters would evaluate and validate hardware used in conjunction with astronaut manual translation (handrails, guided platforms, etc.) and bulk package transfer devices. This proposed experiment would contribute technology data in support of ATM EVA film cassette retrieval. We will prepare an EIP (Experiment Implementation Plan) and propose the experiment through our internal MSFC channels. ✓

noted CSH 4/8

Jim Shepherd

Let's visit that setup

B

NOTES 4-1-68 RUDOLPH

B 4/6

1. Countdown Demonstration Test (CDDT) of AS-502 Launch Vehicle at KSC:

o The first CDDT attempt (on Fri., 29 Mar. 68) was terminated just after start of cryogenic loading due to a Lox leak on the S-IVB aft service arm. The debree valve seal on the arm was replaced.

o The second CDDT attempt (on Sat., 30 Mar. 68) was terminated at T-4 hours when the S-IC Lox overfill sensor falsely indicated an overfill condition. The S-IC Lox vent valve #1 position indication switch failed during the hold.

o The third CDDT attempt (on Sun., 31 Mar. 68) ran quite well until T-32 seconds when redlines on the S-II stage Lox pump discharge temperature went too high. The clock was recycled to T-24 minutes. It was determined that the redlines could be exceeded for CDDT purposes; therefore, the Count was resumed and the CDDT was completed at 1:26 pm (CST). Launch could not have been accomplished with this high Lox pump discharge temperature. The CDDT data is being reviewed this morning (Mon., 1 Apr. 68) with R&DO to determine the cause of the problem and corrective actions to be taken.

o A major leak occurred in the helium supply system right after CDDT was completed. Current indications are that the leak was caused by a regulator failure in the facility system.

o During de-tanking an electronic control circuit failed in the Greer hydraulic unit of the S-IC stage and was subsequently corrected. Pressure of approximately 100 psi was available to the stage during the time the hydraulic unit was out. Pre-fill samples will be taken to determine if engine flushing is required.

o Also, during de-tanking, chattering was noticed on one of the S-IC Lox vent valves. Corrective actions are currently being developed.

2. Design Certification Review for AS-503:

The Design Certification Review (DCR) for AS-503 which had been scheduled for Wed., 3 Apr. 68, has been postponed until Wed., 17 Apr. 68.

3. General Accounting Office (GAO) inquiry of schedule incentives:

o The GAO has sent a letter to Dr. Mueller questioning his decision to emphasize schedule incentives and asking the reasons why early delivery incentives were included in certain contracts. The GAO letter indicates that Dr. Mueller took a personal interest in the conversion of these contracts and either approved or modified the incentive fee arrangements proposed by the Centers.

o We are working with Headquarters in developing the reply to the GAO.

B 4/6

NOTES 4/1/68 SPEER

1. AS-502 CDDT: The AS-502 Countdown Demonstration Test (CDDT) was successfully completed March 31 at 1:26 PM CST on the third attempt. The first attempt on March 29 was terminated at T-6 hours due to a LOX leak on a seal between the quick disconnect and the debris valve on S-IVB service arm #6. The count was recycled to T-7 hours and the seal replaced. The count was resumed at 10:00 PM CST on March 30 and proceeded nominally to T-4 hours when a S-IC LOX loading revert was experienced due to a faulty S-IC LOX overfill sensor. The position indication on the S-IC LOX Vent Valve #1 also failed during the hold (required valve changeout). After a recycle to T-7 hours, the count was picked up again at 5:00 AM CST March 31 and the test was successfully completed. There were three holds during the final attempt as follows: (1) short hold for S/C cabin purge, (2) a short hold (few seconds) due to low rate flow on S-IVB Stage LH_2 chilldown pump, and (3) a one hour hold at T-32 seconds due to exceeding the redlines on the S-II Stage LOX Pump Discharge Temperatures of three engines. After the last hold, the count was recycled to T-24 minutes. At least one S-II LOX Pump Temperature was out of the redline limit for this run also. A leak in the Ground Helium Console complicated the post-CDDT detanking. The leak apparently resulted from a regulator which failed in the open position. A problem was also encountered on the ground Greer Hydraulic Unit (S-IC Stage). ✓

2. LUNAR MISSION MOBILE SUPPORT: Three possible benefits which might result from a reduction in launch window for Apollo lunar landing missions have been suggested: (1) increasing payload capability, (2) reducing mobile support, or increasing capability of existing fleet, (3) reducing mission complexity, both in preplanning and mission conduct. Both Bellcomm and our inhouse studies on the reduction of the launch window have identified some pertinent aspects regarding operational support. The number of Apollo/Range Instrumentation Aircraft (ARIA) could possibly be reduced from eight to four. However, since we have previously identified a strong desire to cover pre-ignition sequencing as well as second burn, no reduction in aircraft would be realized, only an increase in coverage. Abort recovery aircraft could possibly be reduced from six to five. The number of tracking ships would not be reduced, but the abort recovery fleet could possibly be reduced from seven to five ships. Generally speaking, a "launch-on-time" increases the capabilities of our mobile fleet and eases the support complexity (principally for ARIA). It will not result in any substantial reduction in basic operational support. ✓

B 4/6

NOTES 4-1-68 Stuhlinger

1. ASTEROID OBSERVATIONS: Asteroid Icarus will approach the earth closer than usual this June. We hope to make observations with the RCAA telescope, the SSL 12" telescope, and the image orthicon system presently under development at SSL for meteoroid observations. Of particular interest are observations of temperature, and of reflectivity in different wavelength regions. ✓

2. IRRADIATION OF NUCLEAR EMULSIONS: Following our ATM film radiation studies, we were requested by OSSA and GSFC to conduct a similar experimental and theoretical study for nuclear emulsions to be flown in ATM-type orbits and early Apollo missions. OSSA will provide $75 K in FY 68 and $75 K in FY 69 for irradiating equipment and proton and electron accelerator time. ✓

3. LASER ABSOLUTE GRAVIMETER: You raised a question concerning the purpose of the laser gravimeter mentioned in my Notes of 3-11. This instrument was conceived for the purpose of obtaining absolute gravity measurements on the lunar surface. This work was initiated when MSFC was acting in a Lead Center capacity for post-Apollo lunar surface planning. The task was retained at MSFC when the bulk of the program was transferred to MSC since the experiment was conceived by Dr. Hudson in SSL.

The Laser Absolute Gravimeter obtains gravity measurements by observing the rate of fall of a freely falling body. The falling object is a corner reflector and the line of drop constitutes one leg (of varying length) of a Michelson interferometer. Monochromatic radiation is provided by a laser source. As the object drops, bright and dark interference bands are alternatively seen by a detector and are counted. The gravitational acceleration can be determined by measuring the time needed for a given number of interference bands. ✓

Mr. Iverson of the Army Map Service in Washington visited MSFC last week to learn of our work on this gravimeter. The engineering model was demonstrated to him and he seemed favorably impressed. Mr. Iverson is interested in potential terrestrial applications.

The Laser Absolute Gravimeter development is being sponsored by Mr. Wilmarth in Lee Scherer's new office. Mr. Wilmarth would be very pleased to see a "spin-off" (earth application) for one of the lunar instruments. ✓

Bill Teir
What about the ASI in the SIVB's J-2 engine? Maybe we want to change it in view of what happened with 502!)
B

B 4/6

NOTES 4/1/68 TEIR

SA-205 STAGE DELIVERIES: S-IB-205 arrived at KSC March 28. S-IVB-205 and IU-205 will be delivered to KSC aboard the Super Guppy on April 8 and April 9 respectively. Approximately one week of inspection activities on the S-IVB-205 in the horizontal position will be accomplished prior to the stack date now set for April 15 and 16.

ELIMINATION OF NEAR-PAD CRITICAL SINGLE POINT FAILURE: General Phillips during the Liftoff Hazards Review at KSC prior to the SA-204/LM-1 launch, asked that critical single point failures which could cause near-pad catastrophes be reassessed and eliminated if feasible. As a result of an R&DO review an ECR was submitted for elimination of single failure points in the S-IB engine cutoff circuitry. Some 13 relays, 473 wire changes, 8 diodes, 12 resistors, and over 1000 solder connections in three distributors of the S-IB Stage as well as S-IVB and IU hardware (minor) would have been affected by this change. After assessing the magnitude of the change, the late availability in the launch checkout cycle for installation of the change on S-IB-205, and the low probability of failure (probability of an inadvertent shutdown of approximately 14×10^{-6} for a single engine and 8.1×10^{-6} for a four engine shutdown) it was felt that any small gain in overall stage reliability (change in the fourth or fifth nine) could be negated by the major rework. Although R&DO is of a unified opinion that the elimination of the subject single point failures is a desired improvement to minimize pad or near-pad catastrophes, they did concur in my disapproval of this change for SA-205. I have informally told General Phillips of my decision to disapprove this change.

SA-205 DELTA DCR: We have received work informally from Headquarters that the SA-205 Delta DCR is to be rescheduled for April 16, 1968.

NOTES 4/1/68 WILLIAMS

B 4/6

NASA Planning Activity: The NASA (Newell) planning activity is getting into full swing, and several meetings have already taken place. All indications are that this is going to not only be a meaningful activity, but one that will also consume a significant amount of Marshall's (and, hopefully, Marshall management's) time over the coming five months. I would like to suggest that you have a status review at your convenience in approximately two weeks, as well as set aside, on a regularly scheduled basis, some time on your calendar so that we can keep you informed, as well as obtain your guidance in our involvement in this effort.

We're working on this!
BH/ks
4/3/68

Jim Shepherd
Let's discuss this
B

noted BH 4/8

April 8, 1968

NOTES
MR. GORMAN'S COPY
4/8/68 w/ Comments

Dr Hoelzers notes to UBox
4-15-68

no other comment for DEP-A

B 4/12

NOTES 4-8-68 HOELZER

1. AUTOMATED MEDICAL ANALYSIS SUPPORT: As a first step in the automation of medical records at MSFC, the scheduling and notification of NASA employees for periodic physical examinations is now being accomplished mechanically. Additional support areas have been studied, with the conclusion being that further research in the medical field is an important undertaking that could be accomplished with a five-man effort for one year. The work plan submitted was very well received by Management Services Office. They have a keen desire to mechanically massage the medical data of MSFC personnel in an effort to determine the incidence of various diseases and, hopefully, to attain the ability to detect at an earlier time the onset of disease or its symptoms. They feel certain that the statistics and data accumulated will not only be useful to the MSFC and NASA Occupational Health Program, but also will materially assist other medical research programs. The completion date for the work plan cannot be solidified at this time because of a lack of available manpower for assignment to this project.

Harry S. I hope we are taking adequate steps to protect privacy of medical information B

2. EXPERIMENTAL STUDY: The Department of Interior, through cooperation with NASA, has sent Dr. Dahlem and his geological team from Flagstaff, Arizona to MSFC to conduct an experimental study using the Simulation Branch's Lunar Surface Vehicle Simulator. This was arranged by C. D. Carlile of R-ASTR-A. This study involves driving the vehicle simulator and making geological observations. The driver's descriptions are recorded on tape for future use and are also heard by two other team members who use the information to mark maps on an x-y plotter (which also plots position) and to code the information so it can be used in a digital program. This program is used on the Branch's 6050 digital computer which analyzes the data and recognizes patterns in the rock formations and terrain. This is an experimental study to determine the feasibility of using the MSFC simulator as an addition to field studies. An important part of the simulation is the use of an automated navigation system proposed by Mr. Carlile. The navigation system provides position information to the driver which can then be correlated with map coordinates.

Hanson

B 4/11

NOTES 4/8/68 BALCH

S-II-504 Testing - Stage was removed from the A-2 test stand on 4/4/68 and has now been installed in the Vertical Checkout Building for modifications, LOX tank inspection, and insulation repairs. Shipment to KSC is scheduled for 4/26/68.

S-II-505 Testing - Cryogenic proof-pressure test is still scheduled for 4/16/68, but prospects of meeting this date are marginal due to late completion of engine leak checks. Subsequent test milestone schedule dates may also be impacted, but the APD-4H date of 6/30/68 for on-dock KSC is still expected to be met.

S-IC-506 Testing - Stage "power-up", originally scheduled for 3/25/68, was completed on 4/4/68. Stage contractor has now tentatively realigned his working plan to provide for changing the dates for propellant loading and static firing from 4/16/68 and 4/30/68 to 4/25/68 and 5/9/68, respectively.

Use of MTF Telemetry System to Track AS-502 Flight - On an experimental basis, the MTF telemetry systems was utilized in an attempt to track the AS-502 during its launch and flight on 4/4/68. The last minute of the S-IC stage and two minutes of the S-II stage were obtained on the launch, and the transmitted signals of the S-IVB stage and the capsule were obtained as they passed in orbit south of New Orleans.

Legal Affairs - A report, including relevant documents, of the facts concerning the accident at MTF in which John Stell was killed, was forwarded to the U.S. Attorney for the Eastern District of Louisiana in connection with a suit by Eileen Landry Stell, the widow of John Stell, which is being tried in the Federal Court in New Orleans.

NOTES 4/8/68 BELEW B4/11

ORBITAL WORKSHOP HABITABILITY STUDY: The MSFC contract with Loewy/Snaith, Inc. was finalized April 3. This contract is for habitability studies of both the Saturn I and Saturn V OWS and is for a period of nine months with major emphasis on the dry Workshop. Mr. Loewy is scheduled to repeat his AAP-2 OWS study report twice in the next two weeks: (1) to Dr. Mueller on April 12; and (2) to MSC (primarily Flight Crew Operations) on April 16 at Houston.

MDA/BIO-MED EXPERIMENTS/EARTH LOOKING EXPERIMENTS: In response to one of the outputs from the recent MSF meeting at KSC, we are looking with P&VE at configuring the MDA such that certain bio-med experiments can be hard mounted and operations initiated in the MDA early in the Workshop mission. Preliminary results indicate that certain modifications to the internal layout and packaging rearrangements can provide for hard mounting and operating essentially all of the bio-med experiments in the MDA and still proceed within 30 hours from launch to activate the Workshop with about a 2 day delay over the current plan (seven days versus 5 days). A meeting with MSC and MSF on this subject is planned at MSC April 10-11. We are also looking at the capability of satisfying earth looking experiments during Mission AAP-1/2 and 3A. At MSC we expect to explore "candidate" earth looking experiments and their requirements.

ZERO "G" HARDWARE: The work statement supplementing Letter Amendment 1655 and adding the zero "g" hardware is ready for transmission to McDonnell Douglas as soon as the delivery dates are established. This hardware will be developed on a "no planned overtime" basis which may slip the delivery by two months. Preliminary information from MSC indicates no problems with obtaining an aircraft for these tests.

ATTITUDE CONTROL SYSTEM (ACS) AND SOLAR ARRAY SYSTEMS (SAS) MEETING: The first of a series of monthly MSFC/McDonnell Douglas Saturn I Workshop ACS and SAS interface meetings was held at MSFC on April 2-3. The purposes of these meetings will be the exchange of technical information and the generation of specific action items. The ultimate purpose of the series of meetings is to release the ACS and SAS Interface Control Drawings.

McDONNELL DOUGLAS PLANNED OVERTIME: A TWX was released to McDonnell Douglas disallowing any planned overtime for Saturn I Workshop effort. This TWX relieves McDonnell Douglas on the required delivery date of July 31, 1969 for the flight article.

ATM CONTROLS AND DISPLAYS: The ATM Controls and Displays Committee met April 4 to further define requirements for controls and displays. The committee has scheduled a meeting for April 18 to review panel layout baseline; May 1 to review resulting integration requirements; and May 15 to finalize committee's activities with a Control and Display Delta Preliminary Design Review).

NOTES 4-8-68 BROWN

B 4/11

H-1 ENGINE The next static firing (35 sec.) on S-IB-11 is scheduled for April 9. All flight engines will be installed. Four engines will have bellows-type LOX seals and four will have lip-type. The carbon nose of the seals will be inspected post test.

F-1 ENGINE Preliminary data indicates that all five F-1 engines functioned satisfactorily during the AS-502 flight.

J-2 ENGINE Flight data of sufficient frequency has been received by Rocketdyne to permit construction of a detailed sequence of events; however, conclusive causes of the restart failure on S-IVB-2 stage have not yet been established. The data from the first burn of the J-2 engine infer a flash fire occurred at approximately T 5 + 80 sec. presumably from a cryogenic leak. The restart conditions at the J-2 engine were within acceptable limits and the engine valves opened upon command. Ignition was attained in the gas generator indicating the ignition system was functioning. At present the restart failure can be attributed to a lack of ignition in the augmented spark igniter (ASI). Whether the failure is due to the absence of spark signal, or lack of propellants has not yet been established.

The flight data available for analysis at this time has not been of sufficient frequency to support a detailed failure analysis of the number two engine's premature shutdown. Higher frequency data is becoming available this morning (April 8). The analysis to date has established that adequate engine inlet conditions were being met; however, an 18 psia drop in thrust chamber pressure was recorded and engine shutdown was initiated by the thrust O.K. pressure switch at approximately 408.7 seconds.

The premature shutdown of engine number 3 on S-II-2 has been definitely attributed to cross wiring in the stage resulting in the closing of the LOX pre-valve for number 3 when the number 2 engine shut down.

A detailed presentation of the J-2 engine anomalies on the S-II and S-IVB stages of AS-502 is planned for Wednesday (April 10) at MSFC.

The testing at AEDC on 4/2/68 was terminated after a successful restart couple in support of the 80 minute restart program due to a facility water valve failure. A test period was attempted 4/4/68 to complete the testing planned for 4/2/68, but automatic cutoff occurred during the start transient of the first test when the bleed valves failed to close. Cutoff was caused by a failure in the helium control system. The cause of failure is under investigation.

B 4/11

NOTES 4/8/68 CONSTAN

VISTORS TO MICHOUD

On Tuesday, April 2, 1968, Messrs Thomas Burkett, Robet Molloy, D. E. Ochse, William Roberts, Caleb Hurtt, and Richard Brown, representatives of the Martin Marietta Corporation visited Michoud. The group was given an orientation briefing by Dr. Constan and a tour of the Michoud facilities.

On Wednesday, April 3, 1968, Messrs Louis Fong, John Patton and Captain Ray Thompson of NASA Headquarters, Mr. Frank Godsey, Consultant to Mr. Webb, accompanied by Mr. Charles Barker of MSFC were briefed on the organization and mission of Michoud and then were conducted on a tour of the facilities.

NOTES 4/8/68 EVANS

B 4/11

No Comment.

NOTES 4/8/68 FELLOWS

B 4/11

Negative Report

NOTES 4/8/68 GEISSLER B 4/12

1. NASA Headquarters Planning Coordination Group: Among the several working groups supporting the Planning Coordination Group chaired by Dr. Newell, one is concerned with Space Applications, and is chaired by Mr. Leonard Jaffe (OSSA). Mr. William W. Vaughan of our Aerospace Environment Division was requested by Mr. Jaffe to serve as a member of the Space Applications Working Group, relative to the area of meteorology. Basically, the functions of the working groups are: (1) to take a critical look at the overall objectives of various programs, (2) to recommend revised objectives and ways they can be accomplished, and (3) to recommend areas which need to be studied. The working groups will develop a NASA Planning Source document covering the time period 1970-1980. This document will form the basis for the 1970 budget request. Mr. Vaughan will attend a meeting of the Space Applications Working Group, which is to be held in Washington on April 8th and 9th. ✓

2. AS-504 and Subs Spacecraft Breakup for S-IC Single Engine-Out: The presentation on this subject to Dr. Rees by Boeing/Huntsville, mentioned in Notes 4/1/68 Geissler (copy attached), was attended by representatives from Aero-Astrodynamics Laboratory, P&VE, and IO. It was concluded that a S/C beef-up to withstand loads of $6.9X10^6$ in-lbs (maximum predicted loads for 504 at S/C station 1010) was not feasible; in addition, it was felt that loads of this magnitude would probably cause problems in other portions of the S/C such as SM or LM, as well as CM/SM joint. Problem will be approached by MSFC investigating methods of reducing loads, and MSC investigating methods of increasing S/C load capability. Following action items are in progress: (1) MSFC will re-analyze F-1 engine-out malfunction, from the standpoints of component reliability and engine thrust decay characteristics following malfunctions (S/C loads are very sensitive to thrust decay rate); ✓ (2) MSFC will investigate all aspects of canting the F-1 outboard control engines, with either an electrical bias or mechanical fix, to help alleviate the loads for S-IC control engine out; a 2 1/2 degree cant will be analyzed, since this is approximately the limit for electrical bias, and being able to maintain control for nominal flight; this will reduce the S/C loading to $5.8X10^6$ in-lbs for one S-IC engine out; ✓ (3) MSC/NAR will determine present S/C capability for single F-1 control engine out, and beef-up necessary to withstand loads of $6.0X10^6$ in-lbs bending moment; ✓ and (4) MSC/NAR will test S/C in August 1968. ✓

3. Control Systems Design Techniques: Motivated by the need to develop analytical techniques to replace the trial and error procedures used to design control systems for vehicles such as the Saturn V, a new mathematical theory has recently been developed by personnel of the Aero-Astrodynamics Laboratory & its contractors. Now, for the first time, it is possible to minimize the maximum value of some function such as the bending moment in a direct straight forward way. So far, the theory is able to handle only winds known apriori and the control system, at this stage of development, can only function open loop. However, this work is considered to be a major mathematical "breakthrough" which will soon provide a means to quickly synthesize vehicle control systems. This quick synthesis will be possible when we succeed in closing the control system loop. The mathematical theory is likely to find wide applications outside the field of space applications. ✓✓

9

NOTES 4-8-68 GRAU

B 4/12

KR SURVEY REPORT: The Quality and Reliability Assurance Laboratory and the Saturn V Program Office have reviewed the draft report concerning the recent Reliability and Quality Assurance Functional Review conducted at MSFC by NASA Headquarters. The review of this draft edition was limited to the determination of technical accuracy and possible misinterpretation of its contents. Applicable comments have been reviewed and finalized. These comments will be submitted to KR for utilization in making necessary corrections to their initial findings and evaluations prior to completion of the final survey report.

This Laboratory's impression of this report can best be summarized by the following general comments which are used as a preface to the numerous specific comments contained in our response. "It is realized that the task to run a survey on the quality and reliability assurance activities in an organization the size of MSFC with its diversified projects, within a two-week period, is a difficult one. Therefore, some shortcomings in the findings and recommendations are to be expected. In the following pages an attempt is made to point out shortcomings and recommend remedial phrasing for consideration for the final report. It is assumed that the final report will look different from this draft, not only from the standpoint of accuracy but also from the standpoint of editing. Presently, the report gives the impression of individual notes which are not strictly tied together and which have not been assessed from the standpoint of their relative importance. By taking this second look, the size of the report can be reduced and the recommendations can be confined to meaningful ones. As the specific comments show, there are areas which are assessed by MSFC different from the assessment by the Survey Team. It appears that undue emphasis was placed on statements of some individuals and not enough attempt was made to put these statements into the proper context."

B 4/12

NOTES 4/8/68 HAEUSSERMANN

1. ATM Control and Display Meeting. The ATM Control and Display Ad Hoc Working Group met at the Bendix facility in Denver on Thursday April 4 to review an initial ATM Control and Display console design which incorporates all the various design criteria generated to date by the Ad Hoc Group. A mock-up of the console installed in the LM tunnel area using a high fidelity facsimile of the mechanical interface hardware was reviewed in detail. The console layout nicely packages all the required functions in the allotted area in the LM tunnel with the exception of certain electrical power management functions which can be placed in a console area of the LM cabin tentatively reserved by MSC for ATM use. A final meeting of the Ad Hoc Group is scheduled for April 18 at MSFC to clean up a number of details and to baseline the console layout. A Preliminary Design Review for the ATM console is planned for mid-May which will hopefully allow us to define an Interface Control Document (ICD) between MSFC and MSC in this important area. ✓

2. ATM Experiments Location Change. It has now been determined that the ATM Harvard College Observatory scanning spectrometer will not have an in-orbit alignment capability due to cost and schedule constraints. At the request of Dr. Tousey, NRL, we have examined what action MSFC could take to assure that the alignment between the NRL-B instrument and the HCO instrument is held to the closest possible tolerance (±14 arc seconds desired) without an in-orbit alignment capability. The desire is for both instruments to view the same sun feature simultaneously, thereby improving the observation timeline. Our best solution is to mount the two instruments back-to-back on the same wing of the experiment package spar, and to co-align them as best as we can prior to launch, preferably using a common collimated source. Accordingly, we are rearranging the experiment layout in the experiment package with a potential two week slip in the manufacturing drawing release data from April 29. We will do the best we can, but have not assured Dr. Tousey of ±14 arc seconds alignment after achieving orbit because of unknown launch environment effects on alignment. ✓

B 4/12

NOTES 4/8/68 HEIMBURG

S-IB (MSFC)
Test SA-53 is scheduled for 4:40 pm on April 9, 1968, on stage S-IB-11. The test will be programmed for 35 seconds. ✓

S-II-4 (MTF)
S-II-4 was removed from the A2 Test Stand at MTF on April 4, 1968, following a successful acceptance static firing test on February 10, and a successful cryogenic proof pressure test on March 22, 1968. The stage is presently installed in the vertical checkout building undergoing insulation rubber doubler modification and LH_2 tank inspection. Due to the new stretched-out schedule, S-II-4 will be shipped to KSC on May 25, 1968. I.O. I hope we beef up that thrust cone prior to shipment to KSC. B

S-II-5 (MTF)
S-II-5 is presently installed in the A-1 Test Stand at MTF undergoing systems hook-up and checkout. A cryogenic proof pressure test is scheduled for April 16, 1968, to be followed by the acceptance static firing test. ✓

I.O. Can we conduct the static firing during Dr. Paine's visit to MTF, 22 April, afternoon? B

NOTES 4/8/68 JOHNSON

B 4/12

Reprogramming Authority for FY '68 OART Programs - We have been granted, by verbal authorization, permission to reprogram up to 10% of the individual FY'68 subprograms. OART (RMR) has stated that written confirmation of this authorization is being prepared for Dr. Adam's signature. This flexibility in reprogramming will permit us to start adjusting year-end residuals earlier this year than has been possible in prior years. This should help us appreciably to maintain an acceptable obligation rate during this last quarter.

OMSF Supporting Development Quarterly Review - The next Supporting Development Quarterly Review is scheduled April 25 at MSC. Aside from some routine matters concerning the "protocol" for the FY '69 submission, the principal topic on the agenda is a review of the "current-state-of-the-art" in the areas of data management, processing, structures, thermal control, life support, power systems, etc. The Marshall presentations will be in the fields of data management, power systems, and thermal control. We plan to review these technologies as practiced on the Saturn and as planned for the workshops and ATM. Competent Laboratory personnel will serve as the MSFC presenters. Dr. Eldon Hall, who has recently succeeded Mr. Merle Waugh as Program Manager for The Supporting Development Programs, appears very interested in effecting some solid planning of the effort in an attempt to make the programs more coherent and to get a better applied research content in them. This next review is for the purpose of establishing the baseline of the technologies as now applied.

NOTES 4-2-62 KUERS

B 4/12

1. Common Bulkhead Manufacturing Technology: Last week the McDonnell Douglas Company presented to us the results and conclusions of several common bulkhead manufacturing technology development contracts from MSFC. These contracts called for the design, fabrication, and testing of several common bulkheads, using several different manufacturing techniques. This program was conceived and funded as a back-up program in support of the S-II and S-IVB stages and was jointly established and monitored by P&VE and ME Laboratories. Left over tooling from S-IV stages was utilized. One technique, the "bonded strip seal" technique, has produced excellent results. The concept of this technique eliminates any fit-up operation between honeycomb core and upper face sheet by bonding the individual components of the upper face sheet; i.e. gore segments, dollar piece, and T-ring, to the honeycomb core instead of a completely welded-up bulkhead. The individual components are then joined and sealed by bonded strips. This bulkhead passed all tests without problems. In the final cryogenic testing to destruction, it bursted at twice the design load. MDC concluded that this is a good and economic technique which they recommend for consideration in the design of any future project. We had invited for the presentation the manufacturing managers of 15 aerospace companies and representatives from NASA Headquarters. This meeting, the tours and social get-together, connected with the event, served again to establish and renew personal contacts of the manufacturing people between prime contractors and other aerospace companies.

2. Status of S-II Mini-Stage: Last week we joined the forward skirt section to the tank. The standard hardware needed for this operation had just arrived in time. We are on schedule. However, we are now entirely out of overtime money and cannot work on the following week ends which will probably impact on the delivery date. During the week we plan to work three 8-hour shifts on this tank.

3. Thermal MDA Test Unit (Football): This unit has now been completed and delivered to P&VE for testing.

W.K. What accounts for that designation? B

NOTES 4-8-68 LUCAS

B 9/12

1. SATURN V - S-IVB O_2H_2 BURNER: The AH-29 restartable O_2H_2 burner formal qualification test program was completed on 4-1-68. All of the 36 planned firing tests were successfully completed. The restartable burner will be installed in AS-503, if manned, otherwise the first effectivity is AS-504.

2. BOILERPLATE 30 FOR SA-503: We have agreed with North American Rockwell (NAR) on the load distribution and weld capability of the BP-30 Spacecraft Propulsion System (SPS) ballast tanks. An offload of 16,800 lbs. is required to fly without structural modifications. This offload requires rerunning the elastic body analysis by AERO. ME Laboratory is manufacturing structural modification kits to be incorporated at KSC in case the offloading cannot be tolerated by the capabilities. KSC impact has been requested by the CCB.

3. REVISED MDA PACKAGING: Our preliminary look at the revised MDA packaging for early operation of the medical experiments shows that we are probably able to accommodate the presently known requirements in the MDA withour major design and timeline impact. Mostly packaging and arrangement changes are involved, provided we use the Command Module as sleep station and crew quarters. It also appears that we will be able to accommodate some earth sensors in the MDA, depending on viewing and pointing requirements.

4. MSFC EXPERIMENTS REVIEW BOARD: On the agenda of the MSFC Experiments Review Board on 4-10-68 is a review of our Cryogenic Technology Experiments (formerly Project Thermo). We have reduced and revised the Experiment packages and now propose unmanned flight experiments. This solves our problem of disturbances by Astronaut motions and eliminates the use of the LM, thereby relieving our payload weight problem.

5. ZERO "G" HARDWARE: The KC-135 aircraft is available from June to December, 1968 for our OWS zero "g" simulation tasks. McDonnell Douglas Company (MDC) is building the mock-up hardware for: (1) quick opening hatch and forward dome penetrations, (2) the food and waste management compartments, the aft tank penetrations and (3) the crew quarters access openings. Personnel from our Human Factors organization are coordinating these tests and are also participating as test subjects. Nine of our Laboratory engineering personnel completed altitude chamber checkout and pressure suit orientation training at Miramar Naval Air Station, San Diego and Norfolk, Va., respectively, in preparation for these tests and underwater suit operations. The zero "g" tests are a requirement of MSC in addition to the Neutral Buoyancy Testing for mission critical astronaut operations. Our preferred sequence of simulation is: (1) 1-g work in our Task Analysis Facility; (2) 6^o of freedom simulator, where applicable in our Task Analysis Facility. (This is most useful for development of procedures for the KC-135 tests and EVA tests.) (3) Neutral Buoyancy Testing; (4) 0-g KC-135 testing.

6. ZERO "G" TESTING IN KC-135: During the latter part of April, our Human Factors people will have a number of research flights for determination of relationships between package inertial characteristics and human control capability during translation and positioning of objects. Following that, beginning 4-29-68, we will have LM-ATM film retrieval simulation flights with Astronaut participation.

B.L.

If possible, I'd like to participate in one of these flight tests to get familia with the problem. Please advise how this can be arranged

B.

NOTES 4/8/68 MAUS B 4/12

TDY SUPPORT TO KSC: Mr. Jerry Fox of my office visited KSC on March 28 - 29 to review the support program with Mr. Van Staden and Dr. Gruene. The consensus was that MSFC has reached a plateau in terms of available support personnel. Action is being taken by KSC to suspend the unfilled requirements. The review revealed that KSC appears to be making very good use of the 42 MSFC personnel assigned on TDY, and our people all seem to feel that they are making a significant contribution to the Saturn-Apollo Program through their efforts. The term of MSFC support now hinges upon the decision on whether or not to man AS 503. Dr. Gruene has asked that we hold our next review in late April in order to redetermine the level of support which KSC needs and MSFC can provide, based on conditions existing at that time. If the decision is made to man 503, then the bulk of the MSFC personnel would be returned to Huntsville soon, with the remaining at KSC being assigned to support AS 205. If AS 503 is to go unmanned, then our people would be needed through that launch.

INSTITUTIONAL BASELINE STUDY: Jerry Kubat and Chuck Koenig will visit MSFC on April 9 to discuss the groundrules and assumptions for the Institutional Baseline Study, which was an action item assigned to General Bogart and the Center Administrative Deputies at the recent Retreat at KSC. This study will assume continuation of MSF capability, without change, and will break out by location the minimum in-house resources, including manpower, facilities and funds required to support the Manned Space Flight program regardless of the program options or the launch rate.

B 4/12

NOTES 4/8/68 RICHARD

AS-502 Flight Performance: Cnce the shock of having significant failures on AS-502 is over and those failures have been identified and fixed, we intend to make a compilation of all the things we have learned from this flight. We demonstrated significant characteristics and capabilities that might never have been demonstrated on a totally successful shot. Such areas as EDS, flight control, separation dynamics, guidance, performance reserves, etc., really were exercised.

Ludie

But don't feel encouraged to have a "repeat performance" of 502 !!

B

NOTES 4-8-68 RUDOLPH

B 4/12

1. AS-502 Launch Vehicle Flight Evaluation:

o The important AS-502 launch and flight data has been received at MSFC and is undergoing intense analysis by the Flight Evaluation Working Group.

S-II Stage:

o The film from one of the onboard S-II stage cameras was reviewed on Friday evening (5 April 68). This camera looked Aft from the S-II stage toward the S-IC stage and it included S-II stage engines #2 and #3 in the field of view. The film indicated that:

- S-IC/S-II stage separation and S-II stage second plane separation were accomplished as planned.

- The S-II stage Aft interstage did not interfere with the engines during separation; and therefore was not a source of the S-II anomalies.

o Reasons for S-II stage engine #2 failure are unknown at this time.

o The analysis of discrete data indicates that S-II stage engine #3 cutoff occurred 1.26 seconds after engine #2 cutoff.

S-IVB Stage:

o The failure to restart analysis currently indicates that there was a failure in the engine ignition system.

2. Gen. Phillips will be at MSFC (HOSC) on Wednesday, 10 April 68, to review the flight anomalies. Mr. Lindberg of the Flight Evaluation Working Group has the lead for the presentation. Our contractors will support as required.

3. AS-503 Launch Vehicle (Un-Manned BP-30) at KSC:

o KSC is continuing with prelaunch checkout.

o Structural modification of the Boilerplate 30 spacecraft may require de-stacking of the spacecraft.

- We will meet with George Hage (MSF) on Wed., 10 Apr. 68, at MSFC to review actions associated with the modification.

o MSF has instructed KSC not to proceed with AS-503 ordnance installation or rollout at this time.

NOTES 4-8-68 Stuhlinger

B 4/12

1. PROJECT SCIENTIST FOR ATM: Dixon Forsythe, Jesse Mitchell, Henry Smith, Harold Glaser, and other members of OSSA whom I met last week are very strongly in favor of Dr. Dozier's new role as ATM Project Scientist in Bill Horton's ATM Project Office. They have felt the need of a representative of science as a full-time member of the project office as badly as we felt it here. ✓

2. PRESENTATION TO ASTRONOMY MISSIONS BOARD: I heard several comments from OSSA members on your presentation to Dr. Goldberg's Board on 3/16, all very favorable. Of particular interest were your statements that MSFC has the intent to support astronomical space projects in their own rights, not only as "byproducts of manned stations." There is a growing fear among astronomers that their projects will be lost if subjected to the immense requirements of time, funding, quality assurance, and administration that presently characterize manned projects. ✓

Lee Below
I agree!
B

3. PRESENTATIONS AT AMERICAN ASTRONOMICAL SOCIETY (AAS): I gave a brief report on ATM-A to the AAS in Charlottesville last week. Dr. L. Spitzer presented an excellent review paper on manned space astronomy in which he made a strong plea for a 3 m (120") diffraction limited telescope. This telescope could probe a volume of the universe more than a hundred times larger than the volume presently accessible. ✓

4. FUNDING FOR UAH: Dr. Shelton visited with the physics professors to discuss the implications of the funding shifts for the physicists at the University of Alabama in Huntsville. He encouraged them to become better acquainted with their counterparts in the NASA and the AMC.

The Research Institute proposal is now in NASA Headquarters. A copy will be sent to MSFC for evaluation. It is extremely important that MSFC respond affirmatively from the highest level if the University of Alabama Research Institute is to avoid a severe cut in the NASA grant for interdisciplinary research.

Jim Steph.
I think this is in your hands
B

5. LUNAR ECLIPSE: Preparations are being made for the April 12 total lunar eclipse. An additional infrared radiometer has been fabricated that will simultaneously measure the visible photometric properties of the lunar surface. In addition to the IR and visible measurements, the water vapor content of the atmospheric air path will be measured, as well as the relative extinction, and the total lunar intensity change at 0.9 microns. One SSL team will go to the University of Georgia, and the other team will be at RCAA in Huntsville. This way we hope to beat the weather, as we did during the last eclipse. The additional PM photometers and silicon photometers to measure the atmospheric conditions have been fabricated in-house. ✓

6. APOLLO ATTITUDE SENSORS: Bob Brown of MSC requested all the information we had on our Pegasus environmental effects sensor. He wishes to evaluate them for possible usage as solar attitude sensors on the Apollo service module.

B
(also w/ O'Dell, Krauskar and Simpson)

E.S. If Spitzer takes such a positive stand (and in view of Clark-MSFC's repeated statement that such a big project would be too much for MSFC to handle) maybe we should also invite Spitzer to serve us as a part-time consultant

NOTES 4/8/68 TEIR

B 4/12

SA-205 STATUS: With the delivery of IU-205 to KSC now planned for April 9, 1968, all SA-205 stages will have been delivered to KSC. S-IVB-205 arrived at KSC on April 7 and will be off-loaded from the Super Guppy today. Erection of S-IB-5, which arrived at KSC on March 28, is scheduled for April 15. ✓

Development of LVDC flight software and SLCC software is proceeding on schedule. Delivery of LVDC and SLCC preliminary programs has been made and delivery schedule for the final programs is compatible with KSC need dates. ✓

The present status of the SA-205 launch "Test and Checkout" documentation is considerably better at this point in the launch checkout cycle than it has been on previous vehicles. The update of the 205 "Test Requirements and Specifications and Criteria" has been delivered to KSC. The KSC Test Plan has been reviewed in detail and our approval with exceptions will be sent to KSC today. The SA-205 countdown observer redlines were delivered to KSC on April 3, 1968. ✓

S-IB-11: Short duration static firing is scheduled for April 9, 1968. This will be the first test of the basic engine drain line thermocouple configuration which will be installed on S-IB-5 and interlocked for the launch. However, the ground cutoff system configuration which will be used for this test will be different from the system to be used at KSC for SA-205. Test of the ground cutoff system configuration to be used at KSC is planned for the S-IB-12 static firing. ✓

S-IVB ORBITAL WORKSHOP (OWS) MODIFICATIONS: We have forwarded a request to Level I Apollo CCB to install scars in S-IVB stages 210 and 212, and to install the OWS mod kit in 212 prior to static test of the stage. S-IVB-210 has been designated the backup to S-IVB-212 OWS instead of S-IVB-211 and will have 3 mil. aluminum foil installed. Two mil. aluminum foil was installed in S-IVB-211 before tests revealed that this was not thick enough. ✓

S-IB STAGE STORAGE ENCLOSURE: The first S-IB Stage storage enclosure has been shipped to CCSD at Michoud. Erection will begin today. The airconditioning units to be used with the enclosure have been received and after being checked out here will be shipped to Michoud this week. It is anticipated that within two weeks installation and checkout of the enclosure and subsequent movement of a stage into the enclosure can be accomplished. The second plastic enclosure has been fabricated and will be shipped to Michoud this week. ✓

NOTES 4/8/68 WILLIAMS

B 4/12

1. NASA Planning Activity: There have been several meetings of the various "category working groups" of the planning activity and others are scheduled. Each of the groups is to report to the Planning Steering Group (you are a member of this Group) on April 17 in Washington. The plan is to have the chairman (noted below) report on the following items and the Steering Group will either accept or modify the inputs from the working groups by May 1.

April 24

a. Identification of principal issues
b. Proposed alternatives to be studied
c. Recommended basis for evaluation alternatives
d. Specific project proposals to be studied
e. Proposed special analysis.

Working Groups	Chairman	MSFC Rep.	Meeting Schedule
Ext. of Manned Space Flight	Lord	Becker (Madewell)	3/29, 4/3, 4/5, 4/12
Lunar Exploration	Scherer	Williams (Paul)	4/9
Planetary Exploration	Hearth	Williams (J.Belew)	4/3
Astronomy	Smith	Olivier	3/29, 4/8
Space Applications	Jaffee	Hamilton	4/8
Space Physics	Mitchell	Decher	
Biosciences	Reynolds	Hilchey	3/29, 4/8
Aircraft Technology	Harper	None	
Advanced Space Technology	Sloop	Chase	4/9
Special Launch Vehicles	Rosen	Huber	3/29, 4/6
Supporting Activities	Cushman		
* Institutional Planning	Kubat	Foster	4/8, 4/9, 4/10

* proposed

I would like to suggest that I arrange for an internal review on April 15 or 16 for you and other senior management people. This review would include a brief status report (hitting only significant items) and areas where we feel you should support or take exception to. Since it will be the first such meeting, my guess is that 2 hours would be required - possible 3 hrs. would be desirable - which would include discussion time for just the senior management people.

2. Roles and Missions Split between D. Lord and Capt. Scherer: OMSF defined the division of responsibility between Advanced Manned Missions Program Office (D. Lord) and Apollo Lunar Exploration Office (L. Scherer) for management of lunar studies and program definition efforts. In effect, Capt. Scherer has been given "total technical management of lunar program planning, missions studies, systems definition, and payloads definition" extending through approximately 1976. By inference, D. Lord's jurisdiction would then primarily extend beyond 1976. He has also been charged with a support role for earlier studies as specifically requested by the Apollo Office.

3. SIC/SIVB Presentation: On April 2, Boeing briefed Mr. Webb and key Hdqs. officials on the INT-20 (SIC/SIVB) - (Mr. Stoner and D. Serrill). It was the same story they presented to you. (I have copies.) Mr. Webb was interested in the concept and wants to keep the debate open. He wants to see what Dr. Newell's 10-yr. plan will recommend in the intermediate vehicles area and what future mission requirements will be supported.

April 15, 1968

4/15/68 w/comments Gorman

NOTES
MR. GORMAN'S COPY
4/15/68 w/comments

No comment marked DEP-A

NOTES 4/15/68 BALCH

4/15 RS

B 4/15

S-II-504 Testing - Date for shipment to KSC has been changed from 4/26/68 to 5/3/68 because of requirement to replace engine skirts.

S-II-505 Testing - Cryogenic proof-pressure test which was scheduled for 4/16/68 has been postponed due to requirement for additional tests on LH_2 vent valves at Santa Susana. Cryogenic proof-pressure test is now tentatively scheduled for 4/23/68, pending firm commitment on return of LH_2 vent valves to MTF.

S-IC-506 Testing - Stage contractor's working plan still calls for propellant loading on 4/25/68 and static firing on 5/9/68.

B-1 Position of S-IC Test Stand - All punch list items have now been completed from recent turnover to MTF by the Corps of Engineers.

NOTES 4/15/68 BELEW

4/15 B 4/15

ATM FOLLOW-ON STUDY: The MSFC proposed work statement for additional ATM follow-on studies was discussed with OSSA at NASA Headquarters on April 8. The work statement met approval of OSSA (Dr. Smith and M. Aucremanne). OSSA would like to have the study concentrate initially on analyses of a free flight station keeping module, periodically retrieved and serviced at the Orbital Workshop. This phase of the study will coincide with Goddard Space Flight Center studies for modification of the Goddard Experiment Package (GEP) telescope design. GSFC will shortly receive 250K to evaluate and establish the design criteria for maintainability of their GEP telescope plans. We are taking steps to tie these GSFC studies and MSFC's closely together.

CONTROLS AND DISPLAY PANEL: A meeting was held at MSC on April 10 for the purpose of getting MSC requirements in the Saturn I Workshop electrical controls and display panels. McDonnell Douglas will submit a redesigned panel layout incorporating MSC requirements by April 18. MSC and MSFC review will be completed by April 25. A design review by MSFC and MSC is tentatively scheduled for April 29.

ATM EXPERIMENT DESIGN REVIEW: The Critical Design Review for American Science and Engineering S054 ATM experiment has been postponed from the last of April to June 3-6, 1968. This will provide additional time to establish a firmer interface definition.

ATM CLEAN ROOM FACILITIES: We met with representatives from Headquarters on April 9 to discuss ATM clean room and facility requirements. I believe we answered all their questions satisfactorily. They want to have all of the ATM facility procurements packaged together for Headquarters' consideration. There are four items involved: The ME clean room; the QUAL clean room; the ASTR sensor/star tracker checkout facility; and the Goddard experiment assembly room.

LM-A BASELINE CONFIGURATION MEETING: A meeting was held on April 11 at MSC to define the recent changes to the LM-A baseline as a result of the March 15 Dr. Mueller meeting. The significant changes are: (1) LM-A automatic rendezvous and remote manual docking; (2) CSM docks first to cluster (no beef-up of docking collar); (3) Delete dual docking capability, i.e., delete probe/drogue bonnet and baseline a probe on the LM-A; (4) Delete Cryo 0_2 tank in CSM; (5) Study dormant LM-A after docking to MDA. Shutdown LM Environmental Control System (ECS).

MDA TASK FORCE MEETING AT MSC (April 10-11): Mr. Harold Luskin chaired the meeting with briefings and discussions concerning: (1) Current MDA design requirements and fabrication status; (2) New bio medical experiment requirements (including support by MDA located food and waste management systems); (3) Proposed "earth looking" experiments for AAP-2; and (4) Requirements for remote docking of LM/ATM to the MDA.

NOTES 4-15-68 BROWN B 4/15

4/15 GSD

H-1 ENGINE In reference to your question on the April 1, 1968, Notes about verification of the LOX seal drain interlock which is planned for installation on S-IB stages, a simulated flight configuration system was static tested last week on a S-IB-11 firing and will be verified again on the final S-IB-11 static test. The flight configuration drain line temperature sensing system will be tested again at least twice on S-IB-12 which is scheduled to be the last static test of Saturn IB stages. The latter two tests will be completed before the first flight test of the new system in AS-205. The flight configuration drain line temperature sensing system consists of a new drain line on the primary LOX seal drain of each engine, a three-element probe in each drain, zone boxes for signal calibration, and measuring racks for signal conditioning. The voltage level detectors and voting circuits will be part of the GSE at KSC and will be tested by simulating inputs. ✓

The H-1 engine LOX seals were inspected after the static test of S-IB-11 that was conducted on April 9, 1968. There were four vented bellows seals and four vented lip seals in the eight engines. All seals were within the criteria established for good seals, however chipping was observed in the bellows seal in engine No. 8. The four vented lip seals and the bellows seal from engine No. 8 were removed for further examination. Five new bellows seals were installed in their place for the long duration test which is scheduled for April 23, 1968. ✓

F-1 ENGINE Due to the masking effect of extraneous oscillations in the digitized data from the AS-502 flight, Rocketdyne has not yet been able to confirm that F-1 engines were synchronized in a 5 cps structural propulsion oscillation in the time period from T plus 100 to T plus 140 seconds as reported at the review last week. Oscillograph data indicates that at least the four outboard engines were tuned for about two seconds at approximately T plus 124 seconds. However, evaluation of the possibility of using: (1) the LOX prevalve as an accumulator and (2) helium bubbling to shift the frequency away from vehicle first longitudinal mode is underway. ✓

J-2 ENGINE Five successful J-2 engine tests, consisting of two S-IVB 80-minute restart couples and one S-IVB launch constraint reduction test, were conducted at AEDC on April 10, 1968. All test objectives were met. The next test period is scheduled for April 16, 1968.

A task team has been established under Jerry Thomson of P&VE to channel and coordinate the MSFC input into Rocketdyne's activity on the AS-502 engine investigation. The team accompanied by Mr. Morea will go to Rocketdyne early this week and be on the scene as long as necessary. ✓

NOTES - 4-15-68 - CONSTAN

B 4/15

4/15 9P

Nothing of special significance.

B 4/15

NOTES 4/15/68 EVANS

4/15 9A

The MSF Safety Director's Monthly Meeting was held at the Marshall Space Flight Center, April 10, 1968. Some of the attendees were:

Mr. Hayes, NASA Safety Director's Office
Mr. Lederer, MSF Safety Director
Mr. Fetherolf, MSF Safety Office
Mr. French, MSC Safety Office
Mr. Atkins, KSC Safety Office ✓

NOTES 4/15/68 FELLOWS

4/15/68

B 4/15

Negative Report

4/15/68

NOTES 4/15/68 GEISSLER

1. OWS Attitude Control System (WACS): Elements of MSFC and MSC have recently completed an attitude time line for Cluster I mission and identified the functional requirements for WACS. Three major items requiring further attention are: (1) Man-in-the-loop definition and resulting requirements for a control station within MDA, (2) Pointing and control requirements for mission 1/2 and mission 3A experiments, and (3) Possible LM/ATM unmanned rendezvous impacts. Resolution of all remaining effort is proceeding rather well with possibly the exception of MSFC providing capability to accommodate earth resources experiments. We feel that every effort should be made to provide an earth looking mode of operation including the possibility of increasing the orbital inclination. Docking port no. 3 will be pointed toward the earth (X-POP rolling at the orbital rate) during all rendezvous and docking operations with the OWS. This docking port could be replaced with an optical window and the mode discussed above utilized to accommodate the aforementioned experiments. Major problem associated with this scheme is loss of solar array power (~50%) during a portion of the mission when the power requirements are very demanding. Three solutions have been discussed with I-S/AA - (1) Investigate the possibility of obtaining more power from the CSM fuel cells, (2) Limit the OWS functions during the periods of performance, and (3) Reinvestigate the decision to use ATM panels on the OWS. Information received from Lockheed, Fairchild-Hiller, and elements of MSFC indicate that more arrays can be packaged in the existing solar array envelopes with no weight increase. Therefore, we feel that the latter item should receive much attention.

2. AS-503 BP-30 Meeting: A meeting was held on April 10, 1968, with Mr. G. Hage (Gen. Phillips' deputy) to discuss potential fixes which could be applied to the Boiler Plate Service Module (SM) to prepare it for flight on AS-503. Presently designed SM propellant tank aft bulkheads are incapable of accepting S-IC boost loads, when sufficient liquids are loaded in the propellant tanks to bring the S/C weight up to the 95,000 lbs design goal. Fixes considered are: (1) Off-load ≈16,680 lbs of liquids from SM propellant tanks, but make no structural modifications to the SM (Requires ≈ 3-4 weeks for vehicle dynamics investigations, possible necessary control system modifications, and software change implementation); (2) Use hard ballast in SM propellant tanks (Requires removal of SM skin and propellant tanks and hard-ballast installation while tanks are horizontal; fixture, tooling, and assembly problems are associated with this fix); (3) Beef-up the SM structure to take the flight loads (Requires ≈19 days to complete at KSC; this fix would enable SM liquid loading to provide total S/C weight of 95,000 lbs; design of this modification is complete, and necessary hardware is at KSC.) It was decided that SM structural modifications will be made (#3 fix) and that the S/C flight weight will be 95,000 lbs.

3. AS-504 Spacecraft Breakup for S-IC Single Engine Out: We reported on this subject in Notes 4/1/68 Geissler and 4/8/68 Geissler (copies attached). Re: your question on item 3, Notes 4/1/68: The potential problem associated with this subject was uncovered by the Boeing/Huntsville Saturn V Systems Engineering and Integration contractor, while working on the Saturn V EDS analysis under the direction of our laboratory.

4

NOTES 4-15-68 GRAU

4/15/68

B 4/16

1. AS-502: With regard to the premature shutdown of engine no. 3 on the S-II stage and the crossed wiring cause, there are certain things we must learn from this unfortunate event. The main thing, I believe, is to minimize in some manner the work and testing being pushed downstream because of schedule pressure. The validation by test of the changes made to these wires at Seal Beach should have been done at Seal Beach but was pushed on downstream to MTF and then again waived to KSC. I believe a moratorium should be declared on pushing work and tests downstream.

A. Rodolfo — Suggestion has lots of merit. I think the delivery situation has improved sufficiently to permit us to do that. Request comment. B

↳ "Waiver requiring approval by Sat V Progr. Office".

I recognize that this is not always possible; however, it is happening too frequently. We should look carefully at our methods of allowing work to flow downstream. The recipient of a stage should actively participate in the "turnover" meeting and verify that he understands the work and testing that he inherits and that he can satisfactorily accomplish it.

We must also see that all changes and modifications precisely spell out the retest requirements and when the change should be made, i.e., prior to static firing, prior to post-static firing checkout, etc. I have specifically requested that this be done by IO many times. This policy is being complied with in varying degrees by different stages. I suggest that a management instruction be issued by IO which would require that prior to change approval the following be spelled out:

- Where in the sequence of operations the change will be made.
  The prior testing and systems that will be invalidated.
  The retest requirements—where and the procedures to be run.

If it becomes impossible to abide by these requirements the change should be re-submitted to the change board. We are presently re-evaluating all changes and modifications made to all stages of AS-502, AS-503, and AS-205 in order to determine whether they were properly re-validated by test. We are also participating in evaluating the differences between 501 and 502 for:

- As-built condition of the structure and fluid piping systems.
  Life cycles at time of launch of suspect critical components.
  ASI line manufacturing processes and materials used.

I.O. Please advise what actions have been taken. Should cover Sat IB and Apollo, too. B

2. S-IU-505: DCAS completed the evaluation of the Simulated Plug Drop Test and signed the Test Compliance Document, April 3, 1968. IBM has disconnected this IU from the checkout station. Fifteen Guidance and Stabilizer Tests were not accepted by Q&RA because of outstanding component modifications, and seven Control Tests were not accepted because of the absence of a flight control computer. A modification period is planned for this IU with no retest scheduled. We recommend retest. KSC shipping date is June 27, 1968.

B 4/16

NOTES 4/15/68 HAEUSSERMANN

4/16 B

1. Saturn V Auxiliary Propulsion System (APS). The rate of propellant consumption for the APS on 502 was originally reported to be unusually high. However, when the unique circumstances of this flight are considered, the consumption rate is explainable. The following conditions resulted in higher consumption than predicted for a nominal flight.

a. The unusual cutoff conditions at parking orbit did not provide the normal attitude command freeze and the pitch rate was 1°/s compared to previous flights of about 0.05°/s at the end of 1st S-IVB burn. This rate and resulting attitude error required appreciably longer operation of the APS than would have been the case if the thrust vector control system had reduced the rate before cutoff.

b. The failure to reduce moment of inertia of the vehicle by a second S-IVB burn created about ten times more consumption during maneuvers. In addition, the shift aft of the center of mass after the spacecraft separated reduced the effective lever arm and decreased the turning rates for a given impulse.

c. The expulsion of propellant from the heavily loaded S-IVB tanks created disturbing torques which finally depleted the APS propellant reserves. ✓

2. ATM Contractor Visits. Last week, Bill Horton, Rein Ise, Bill McKinney, members from P&VE and ASTR Labs and I visited Bendix and Perkin-Elmer. At Bendix, we reviewed the status of the ATM hardware (Controls & Display Console, Control Computer and CMG's) and found the program to be in good shape technically and managerially. One technical problem which was brought out by test results is that the CMG rate loop stability is less than the predicted value. One possible reason is backlash in the gear train. Further tests will be accomplished at Bendix and MSFC to determine the cause and find a solution for this problem. At Perkin-Elmer, we reviewed the gimbal system for the experiment canister, the dynamic simulator to test the gimbal system and the hydrogen alpha telescopes. Perkin-Elmer had indicated there would be schedule problems with the simulator and gimbal system, but after we probed for the reasons behind their statement, we were able to clarify certain contractual/management positions Perkin-Elmer was taking and this resulted in a significant improvement in their schedule forecast. We also saw the efforts Perkin-Elmer has going on the segmented mirror for in-orbit alignment for a larger telescope. I believe we should bring this activity to Dr. Mueller's attention. ✓

O.K. Next time he's at MSFC! B

NOTES 4/15/68 HEIMBURG

B 4/16

4/15 SIB

S-IB (MSFC)

A 35.3 seconds test, SA-53, was successfully performed on stage S-IB-11 at 4:40 pm on April 9, 1968, with cutoff occurring, as programmed, by the firing panel operator. All test objectives were attained.

All lox pump seals were examined following the test. An abnormal "glazed" appearance of the carbon nose surface was noted in two vented lip seals and in one stainless steel bellows seal. The bellows seal carbon also exhibited unusual chipping. All vented lip seals were replaced with new bellows type carbon seals. The chipped bellows seal was also replaced "in kind" with a new seal. The next test for 143 seconds duration is scheduled for April 23, 1968.

S-II STAGE (MTF)

S-II-5 is presently installed in the A-1 Test Stand at MTF undergoing pre-test checkouts. Three LH_2 prevalves and all five of the lox prevalves will be replaced due to a seal material problem discovered during quality testing. The LH_2 prevalves should be on site today and the lox prevalves should arrive on April 20, 1968. The special LH_2 vent valves used for cryogenic proof pressure test are being shipped back to Battleship for re-test since the plenum chambers were removed and the relief settings were changed. The valves should complete test and arrive at MTF on approximately April 19 or 20, 1968. The LH_2 fill and drain line (facility) is five inches too short. A spacer is being installed to correct this. A porosity in the stress relieve area of the LH_2 tank was discovered by Seal Beach personnel. This will cause a further schedule slip if inspection or other action is required.

S-II-4 is located in the Vertical Checkout Building at MTF. Rubber doubler replacement and lox tank inspection are in progress. The static firing skirt has been removed for use on another S-II stage at Seal Beach. It was replaced with the S-II-F/D skirt on April 8, 1968.

B 4/16

NOTES 4-15-68 HOELZER

4/16 (B)

REMOVAL OF MSF/MSFC DATA LINK EQUIPMENT: Necessary steps are being taken to remove the remote terminal equipment in Executive Staff and NASA Headquarters. The purpose of this R&D effort was to prove the feasibility/practicality of providing an on-line communications data link between MSFC and MSF. PERT and Cost Correlation Technique (PACCT) data was the application used in support of this effort. Having accomplished the objectives of the pilot phase and due to current budget reductions and the present stage of development of the Apollo Program, the decision was made to discontinue Data Link operation. Both affected offices concur in this decision (Mr. J. B. Skaggs, Director, Apollo Program Control, and Mr. T. H. Smith, Executive Staff). ✓

NOTES 4/15/68 JOHNSON

4/16 9:15A

Nothing of significance to report.

B 4/16

NOTES 4-15-68 KUERS

B 4/16

4/15 RA

1. Status of S-II Mini-Stage: This was the first week we worked three eight-hour shifts on this tank and we are still on schedule without need to work over the weekend. The S-IC sidewall and the lower portion of the forward skirt have been insulated by spray foam. ✓

2. Repair of Hydraulic Cylinder for Crawler at KSC: We are making good progress on the emergency repair job for KSC, working two ten-hour shifts including the weekends (no work on Easter Sunday). The sleeve has been shrunk into the cylinder and is now being machined on the boring mill. A sleeve has also been assembled on the piston by shrinking and welding. Remachining of it is also underway. ✓

3. Neutral Buoyancy Testing: On Friday, April 12, Astronaut Paul Weitz spent some time in our small Neutral Buoyancy tank. He tested the foot restraint rings which it is proposed to install in the MDA to aid the astronaut during package removal and transfer. The neutral buoyancy evaluation is performed to determine the size, shape, comfort, and position of the foot restraints. ✓

4. Serpentuator for ATM Film Cassette Removal: Following a meeting with Lee Belew on our neutral buoyancy activities and your comments when you visited our laboratory, a design, fabrication and test schedule for Serpentuator test and flight articles has been discussed with the lead laboratory engineering managers. The schedules will be firmed up this week. We will present the concepts and schedules for this alternative manner of EVA film cassette retrieval during your forthcoming AAP review meeting. ✓

NOTES 4-15-68 LUCAS

4/15 DS

B 4/16

1. STATUS OF S-II "C" STRUCTURE MSFC TEST 403 (THRUST STRUCTURE FOR S-II-4 AND SUBS): On 4-11-68, the first ultimate test on the thrust structure resulted in a buckling failure of the center engine cross beam shear web. The test condition was five engine thrust, zero gimbal angle, with heat applied to the thrust cone stringers and skin (maximum 300°F) and chilling of the forward thrust cone area to +20°F. Failure occurred at 110% of limit load (should reach 130% without failure). All testing has now been suspended on the "C" structure until structural repairs are accomplished. North American Rockwell (NR) is assessing the problem and will provide a preliminary schedule for the rework today (4-15-68). The thrust structure of S-II-3 has been qualified.

2. BP-30 MODIFICATION: MSF approved the BP-30 Service Propulsion System (SPS) ballast tank skirt modification with an indicated 19-day scheduled slip. However, MSF requested that MSFC reevaluate the ballast requirement and be prepared to make BP-30 simulate the manned configuration.

3. STRESS CORROSION TESTING: Unwilling to accept the results of our stress corrosion tests on the "Premium Quality" 2014 aluminum alloy, NR set up stress corrosion tests of their own and reported results totally contradictory to ours. A representative from this laboratory examined the test procedure at Downey this week with NR/SD, and discovered about two dozen stress corrosion failures that had gone undetected by NR. Several of the specimens had been failed sufficiently long to have extensive surface corrosion on the fractured surfaces. Thus, NR, reluctantly, has corroborated our test experience on the large grain alloy.

4. MDA MEETING AT MSC APRIL 10-11, 1968: Mr. Luskin was the Chairman. The following items were reviewed: (1) Current MDA design and development status; (2) Biomedical requirement in MDA prior to OWS activation; (3) Earth resources experiment package review. Action items resulting from the meeting are: (1) MSFC will proceed with preliminary design to incorporate biomedical and earth sensing experiments as well as LM/ATM remote docking provisions. (2) MSC will officially document biomedical experiments which are required to be operational in the MDA in the early part of the mission. It is our understanding that MSC will have to provide to Mr. Luskin scientific justification for the requirement.

5. ATM VIBRATION DAMPING: There is a requirement for a foam to be used for vibration damping in the telemetry packages. Since we could not find a commercial product that would meet the ATM outgassing requirement, we have developed an open cell silicone foam which is activated by an inorganic blowing agent and meets the outgassing requirements. It is anticipated that we shall have to produce the foam inhouse for the ATM applications.

6. PROPULSION TECHNOLOGY: Four aerospike nickel thrust chamber tests were completed at Rocketdyne's VTS-1 facility during the period from April 3-9, 1968. A total of 16 seconds of mainstage duration was achieved with chamber pressures up to 700 psia and mixture ratios up to 4.9. The third test of the series was cut after one second of operation at 700 psia and 4.9 mixture ratio when evidence of burning copper was observed in the exhaust flame. Post test inspection revealed only very minor erosion in three places on the injector.

7. PERSONNEL: Dr. Yoshiro Kageyama, Tokyo, Japan, has started his Post-doctoral Resident Research Associateship with us. He will work on the Analysis of Saturated Propellant Pump Inducers.

B.L. What is our latest plan re using or rejecting Premium Quality 2014? B

B 4/16

NOTES MAUS 4/15/68

4/15/68

MSF Program Control (Kubat's Office) Hideaway Meeting: Jerry Kubat has requested a Hideaway meeting of his staff and Center counterparts early in June. Three or four MSFC personnel will be invited. Tentative subjects to be considered are improved planning, budgeting operations, and congressional interfaces. ✓

Institutional Baseline Study: As a result of last week's meeting between Jerry Kubat and the three Centers, a set of guidelines for the study has evolved and the Centers have been requested to complete their inputs by May 1, 1968. Representatives from Headquarters, MSC, and KSC will meet at MSFC on May 1 and 2 to establish an MSF position to be presented to Dr. Mueller and the Center Directors at the May retreat. ✓

MSF Review of AO POP 68-1: The review team concluded that no increase is required in the Center's total FY-68 authorization, but they did agree to adjust the sub-limitations for personnel compensation, overtime and travel. The conclusion not to increase the total was based on the premise that manpower strength projections for the remainder of the year were overly optimistic in view of the recent MSFC attrition experience. With regard to FY-69, no specific action was taken on our request pending a better perspective of the FY-69 Congressional situation. MSF expects major AO problems in FY-69 and they are planning to request an additional Administrative Operations POP in May to establish an MSF position. ✓

NOTES 4/15/68 RICHARD

4/16 6 4/16

Apollo Crew Safety Review Board Activity: The John Hodge Board is progressing through the Saturn Apollo System in the traditional fashion of probing for soft spots. These activities sometimes take the form of questioning decisions which, at the time of their making, were not totally accepted by everyone.

Launch interlocks are being questioned in depth, particularly as they may have evolved in accord with guidelines and component or sub-system failure history at the time of implementation, which may not be applicable today. A general case in point is that at one time pad or near pad abort of the spacecraft was considered safer than it is today in the light of unquestionable hazard associated with land landing.

Another Board activity has resulted in the recommendation that a Center interlock control document be prepared, implemented and controlled at the program manager's level. This activity has tentative management agreement but still requires both Saturn IB and Saturn V approvals.

A special group of MSC and MSFC people will be convened to examine the functional systems interface between spacecraft and launch vehicle. This investigation will go beyond the interface all the way to the beginning of the system which causes that interface. It is the intent that this group will not be inhibited by one center's regard of the right of privacy of the other center on its side of the interface.

Since this is the first Crew Safety Board, the Board will attempt to document its activity and findings so that "the next" Board on crew safety can start its activity from a recorded baseline.

NOTES 4-15-68 RUDOLPH

4/15 9AM

B 4/16

1. AS-502 Launch Vehicle Flight Evaluation:

o Several teams of MSFC personnel are at the contractor plants this week consulting on the AS-502 flight data analysis. So far, nothing startlingly new has developed in determining cause of S-II stage engine #2 failure.

2. AS-503 Launch Vehicle at KSC:

o The boiler-plate 30 spacecraft was destacked on Thurs., 11 Apr. 68, in order to accomplish structural mods to the spacecraft. Re-stacking is tentatively scheduled for Fri., 26 Apr. 68.

o Dr. Mueller has cancelled the Saturn IB and Saturn V Design Certification Reviews (DCR's) scheduled for Tues. and Wed., 16-17 Apr. 68. A Saturn V Semi-DCR/AS-502 Evaluation will be held at MSFC (HOSC) on Sun., 21 Apr. 68. MSF asked that we present those subjects that specifically pertain to the determination of manned versus unmanned flight for AS-503; and impact of AS-502 flight analysis on the manning requirements for AS-205.

o The R&DO laboratory support in all efforts connected with AS-502/AS-503 analysis, reviews, etc., has been outstanding. ✓✓

3. S-II Stage Structural Test Program:

o On Thurs., 11 Apr. 68, during ultimate load tests on the S-II stage thrust structure (for the condition of all engines firing full thrust, 0° gimbal) the web portion of the cross beam buckled at 110% of load. The test was planned to go to 130% of load. Tentative indications are that the web of the cross beam can be braced without removing much of the stage hardware. NAR and P&VE are thoroughly analyzing the problem. This is the first major element of the light weight structure to fail during the structural test program. ✓

4. S-II-5 Stage at MTF:

o The cryogenic proof test of the S-II-5 stage which had been scheduled for Tues., 16 Apr. 68, is tentatively rescheduled for Tues., 23 Apr 68, because of late re-qualification of LH_2 cryogenic proof vent valves. ✓

5. Saturn V Pre-launch Systems Analysis: We have been analyzing the pre-launch operations to determine the probability of a Saturn V being available for any launch window. The study indicates where changes in operations would improve the launch availability. The analysis has been presented to KSC; a summary briefing has been prepared for the MCM, 6 May 68. If your schedule permits, we would be pleased to present this briefing to you prior to the MCM. ✓

A.R. → Yes, please arrange with Bonnie B.

4/16

SPEER 4/15/68 NOTES

4/16 9a

B 4/16

1. AS-502 FLIGHT CONTROL: The AS-502 flight control functions connected with the launch vehicle presented quite a few difficult decisions for Bob Wolf, our Booster Systems Engineer (BSE) at the Mission Control Center (MCC). Flight Director Charlesworth and I feel that Bob and his team did a great job. In addition to these decisions, the BSE transmitted the following commands to the vehicle after the unsuccessful restart attempt in an effort to gain information for the post-flight analysis and to "safe" the L/V: (a) Auxiliary Hydraulic Pump on: command sent to attempt to start pump since the failure had occurred during the pre-ignition sequence, (b) Execute Maneuver A: command sent to terminate inertial hold and to initiate orbital pitch rate to stay at local horizontal in order to enhance command and telemetry communication, (c) Tape Playback: command sent to dump recorded data for post-flight analysis, (d) Final commands sent to "safe" L/V were cold helium dump, LOX tank vent open and LH_2 tank vent open. A complete report of all 502 L/V flight control activities is in preparation.

NOTES 4-15-68 Stuhlinger

B 9/16

4/15/68

E.S. Please send me a copy B

1. ASTRONOMY PAYLOAD STUDY: The study of an "Integrated Astronomy Payload for Earth Orbital Operations" as requested last summer by OSSA (J. Mitchell) in the ATM Follow-on Study has been completed and the summary Brown report received. Included are six possible configurations of a total astronomy package integrated into the aft end of a ground-fitted orbital workshop. In keeping with the initial Piland Committee recommendations, the independent operation of these experiments away from the cluster was not considered in this phase of the study. Included in this integrated astronomy payload are three advanced EMR experiments, two optical telescopes for stellar observations, and the ATM-B solar package. Only limited distribution of this latest document will be made since many of the guidelines are no longer appropriate. ✓

As per guidelines recently received from OSSA and recommendations of the Astronomy Missions Board, the next phase of the Astronomy Payloads study will consider the detached module concept. We will concentrate on the high energy or EMR-II type experiments while the integration contractor (Martin) will initially be concerned with the ATM-B and LAOT (Large Aperture Orbiting Telescope) payloads. ✓

2. MAGNETOHELIOGRAPH: Planning and implementation of the magnetoheliograph project as a joint venture between NRL, OSSA, and MSFC (SSL, COMP, ASTR) are progressing satisfactorily. We received 100 K of 1968 funds from R&DO, mainly for optical and electronic components. ✓ Mr. Jesse Mitchell and Dr. Harold Glaser (OSSA) are firmly behind this project as planned; H. Glaser will probably become co-COR; Bill Snoddy (SSL) is COR at MSFC. ✓

E.S. Please arrange with Bonnie B

We would be happy to give you a presentation on the magnetoheliograph project at your convenience. ✓

3. LOSS OF PERSONNEL: Emmitt Wright, physicist, left MSFC last week to accept a position at KSC in a quality control group. His decision was a result of the recent RIF actions; many of MSFC's young engineers and scientists are fearful of further similar actions which might hit our Center again.

Dr. Joe Cortez, physicist in charge of the in-flight mass spectrometer experiment, TO30, will leave on April 24 to join the nuclear physics laboratories at Livermore.

Mr. Claude Sturdivant, Program Analyst in our Resources Management Office, decided to join the Sentinel Office for reasons of "job security". ✓

NOTES 4/15/68 TEIR

B 4/16

4/15 PM

S-IB-11 STATIC TEST: The short duration static test of S-IB-11 was satisfactorily conducted on April 9. Four of the engines were equipped with lip seals and four with the new bellows seal. All test results appeared nominal. Inspection of the seals following the firing revealed that lip seals on engines #2 and #3 and bellows seals on engines #1, #4 and #7 were in very good condition. Lip seals on engines #5 and #6 were not chipped but did show a unique wear pattern. The bellows seal on engine #8 showed minor chipping. The lip seal failure which occurred previously was on engine #8. We plan to install bellows seals on all engines for the long duration test scheduled for April 23. This will include installation of a new bellows seal on engine #8 and reinspection of all seals after the static test. We will make the final decision on seals for 205 after the long duration test. ✓

FIRE DETECTION MONITORING SYSTEM (FDMS): We have given Chrysler the go-ahead on engineering design to improve the S-IB fire detection monitoring system. In this effort we plan to make maximum use of proven hardware and to concentrate on strategic relocation of the sensors and reduction of system response time with the hope of making some improvement in time for SA-205. ✓

NOTES 4/15/68 WILLIAMS

1. This year's contracted study program from OMSF:

Approval has been given to a $5.850M OMSF Study Program to be initiated immediately. MSFC is to have 7 contracted studies valued at $1.85M as listed below. We are presently completing/coordinating the statements of work within MSFC and with Headquarters and plan to start the procurement cycle within the next month.

Saturn V Deviations (S-IC and S-IVB)		$250 K	
Launch Vehicle Traj. Optimization Computer Program		50 K	
Lunar Cargo Delivery System		300 K	
Wheeled Mobility Aid		400 K	
Launch Vehicle and Experiment Cost Analysis		250 K	
Low Cost Earth Orbital Transportation System		300 K	(1)
Integral Launch and Reentry Logistics System	(600K)	300 K	(2)
Chrysler Study	(995K)		(3)

(1) MSC will work with us on this study.

(2) Joint MSFC/MSC, 300K each for two studies.

(3) Exactly what MSFC's role in this will be is unknown at this time. This is a Mr. Webb directed, sole source study, to be run out of Headquarters.

2. Newell Planning Activity:

Seven working group meetings took place last week, and we are working with Jim Shepherd to set up an internal review of this overall activity on the immediate future (between 4/15 and 4/23).

April 22, 1968

NOTES
MR. GORMAN'S COPY

4/22/68 With comments

(None for DEPA)

B 4/25

NOTES 4/22/68 BALCH

4/23 DTS

S-II-504 Testing - Based on revision of stage delivery schedule by NASA Headquarters, shipment of S-II-504 to KSC has been rescheduled from 5/3/68 to 5/25/68. Extended MTF dwell time will be utilized to incorporate additional MTF mods that were to have been deferred and also some of the mods previously planned for incorporation at KSC. ✓

S-II-505 Testing - Cryogenic proof-pressure test has been rescheduled from 4/23/68 to 4/26/68 primarily because of necessity to replace three LH_2 prevalves and requirement to inspect the remaining two LH_2 prevalves. Static firing is now targeted for 5/7/68. ✓

S-IC-506 Testing - Present test schedule, which calls for propellant loading on 4/25/68 and static firing on 5/9/68, could be impacted as much as six weeks by current plans to install on the S-IC-506, prior to propellant loading, certain hardware that is to be flown with the S-IC-503. ✓

J-2 Engines - J-2 Engine 2050 was shipped to Huntsville for a special series of tests relating to failures on the Apollo 6 flight. ✓

Assumption of Transportation Functions by GSA - Information has been received that GSA will assume responsibility for certain transportation functions at MTF on 7/1/68, and GE MTSD has been advised accordingly. ✓

Damage Claim from Stage Firing - Mr. Chester C. Lee of Picayune, Mississippi, through his attorney, Mr. Michael D. Haas, has filed a formal claim for damages he states were caused by the static firing of the S-IC-505 stage on 4/25/67. Mr. Haas is the attorney for Mr. Lee's neighbors, Otho, James, and Larry Rester, who are also claimants for damages from this same firing. ✓

Community Affairs - A NASA representative from MTF attended a meeting of the newly formed South Mississippi Mental Health Association ✓

NOTES 4/22/68 BELEW

A/23 FJS

B 4/25

ATM BROCHURE: The final draft of the ATM Brochure requested by NASA Headquarters has been received from Martin incorporating comments from here and NASA Headquarters. We now plan to forward it to NASA Headquarters for their review and finalization.

ATM PROJECT STATUS REVIEW: The ATM Project Status Review scheduled for April 23 has been postponed because of Dr. Paine's visit at this Center on April 23 and 24. Another date has not been established but it will probably be no earlier than the third week in May because of conflicts with many other meetings already scheduled.

ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION MEETING: The first monthly status meeting on the ESSA ATM solar data analysis contract effort was presented by Dr. Harold Leinback on April 17 at MSFC. They appear to have made excellent progress in assessing the Principal Investigators requirements and categorizing available solar data on a worldwide basis. We plan to have a second meeting in May.

ASTRONOMY MISSION BOARD MEETING: We received information today, 4/22/68, that during the Astronomy Mission Board meeting in Washington on April 19, Dr. Newell stated his doubts that the cluster could be ready to fly until 1972. The basis for his statement is not known, but we are in the process of being severely limited by a dollar ceiling or "holding plan" for the present and extending up to January 1, 1969. As a result of Dr. Newell's statement, Dr. Garriott (astronaut), who was in attendance, presented his thoughts. No OMSF representatives were present, although Dr. Mueller came in later. Dr. Garriott's position was to go with an uncoupled flight which is possible in 1971 per the astronomer's requirements. An executive session was held on April 20. We will relay any additional data we get from Mathews on that session.

EARTH SENSING EXPERIMENTS: Regarding your question on my 4/1/68 Notes as to what MSC is doing in the area of earth sensors and how many could be added weightwise, MSC suggested seven prime candidate earth looking experiments which we are considering incorporating in the cluster at the same time we are analyzing the MDA for earth conduct of bio-medical experiments. These are associated with mapping, meteorology, etc. This complements weights in the order of 500 pounds. Assuming no significant performance improvements are forthcoming, some experiments like the AAP-2 solar astronomy will have to be dropped. This area will be reviewed with you at the AAP Technical Review on April 3 and April 6, 1968.

may

NOTES 4-22-68 BROWN

4/23 B B 4/25

F-1 ENGINE The LOX valve with the seal leakage reported in Notes of April 8, 1968, on AS-503, engine 4022, has been removed and replaced. Pneumatic leak checks of the replacement valve have been successfully completed. A poppet torque check of the valve which was replaced indicates the leakage probably occurred at the poppet skirt seal.

Rocketdyne has completed their Instant Release Study. The results show that the F-1 engines on AS-504 and subsequent can take Instant Release. One turbopump strut would have an ultimate safety factor of 1.37 as compared to the Rocketdyne design standard minimum of 1.50. However, data on this strut from MSFC Structural Testing in 1966 indicated the actual factor is 1.49. ✓

J-2 ENGINE The test program at Rocketdyne has now simulated the three most likely failure modes experienced on AS-502. Two of these simulations (ruptured fuel tank pressurization line and failed ASI LOX line) were reported at the Semi-DCR on April 21, 1968, at which time the ruptured tank pressurization line mode was eliminated from further consideration and the ASI LOX line failure mode was reduced in probability. The latest test, conducted Sunday evening (April 21), simulated an ASI fuel line failure by adding a Tee in the line four inches from the ASI. The Tee lead to two valves which were vented to the atmosphere. The first valve was opened 75 seconds after mainstage was reached. The valve vented through an orifice at approximately 0.5 lb/sec. The second valve opened 10 seconds later and simulated a ruptured ASI fuel line at a flow rate of approximately 7 lb/sec. The engine continued to run for approximately 95 seconds to simulate S-II-2 conditions and was terminated as planned by a timer. The ASI fuel line upper flex section and the Tee section leading to the vent valves were completely burned away. The ASI will be examined for erosion this morning (April 22) and may very well explain a failure of the LOX dome as postulated for the S-II-2 failure. It is considered significant that the engine was capable of operating for approximately 100 seconds after the leak and hot gas back flow were induced without propagating into an immediate shut down. A complete review of the performance data and its matching to the flight data will be required in addition to a physical inspection of the ASI for erosion before positive conclusions may be drawn. ✓

Five successful J-2 engine tests, consisting of two S-IVB 80-minute restart couples and one S-IVB launch constraint reduction test, were conducted at AEDC on April 16, 1968. All test objectives were met. The next test period is scheduled for April 23, 1968. ✓

NOTES 4/22/68 CONSTAN

4/23 SP

4/29

Visitors

On April 19, 1968, approximately 300 Louisiana State legislators and their wives visited Michoud Assembly Facility. Briefings were presented to the group by NASA, Boeing and Chrysler; after which the group was conducted on a tour of the Saturn booster assembly areas.

Astronauts Neil Armstrong, E. E. Aldrin, J. A. Lovell, and G. P. Carr, assigned as Back-Up Crews for S-IC 504, visited the Michoud Assembly Facility on Friday, April 19, 1968. The primary purpose of their visit was to receive a technical briefing on the S-IC 504 Stage. While at Michoud, the Astronauts also attended a luncheon given in honor of approximately 80 Boeing recipients of the "Zero Defects Awards."

NOTES 4/22/68 EVANS

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B 4/22

MSFC Safety Survey

A safety survey of the George C. Marshall Space Flight Center has been scheduled for May 7 - 9, 1968. The purpose of this survey will be to review the MSFC safety and accident prevention program to include the safety functional management organization, documentation, and the industrial safety and spaceflight accident prevention efforts.

Preparations are underway to provide the presentations and support for the survey.

Purpose and Scope - The purpose of the survey is to review the accident prevention program of MSFC (including MTF and Michoud). Interest will be centered on the organization and management of the safety organization and procedures to support line management in achieving safety in operations.

The survey was directed by letter dated April 3, 1968 from Mr. Jerome Lederer, Director, MSF Safety.

Survey Team Composition:

Mr. Jerome Lederer, MY
Mr. P. Bolger, MY
Mr. M. Fetherolf, MY
Mr. D. Hayes, DY
Mr. H. Cohen, ML
Mr. H. Brownstein, MM

NOTES 4/22/68 FELLOWS

4/23 JTS

B 4/29

Engineering Manpower Support for Space Sciences Laboratory: The R&DO Laboratories have been requested to determine the extent to which they can provide selected engineering manpower on detail to the Space Sciences Laboratory to support development of flight experiments. SSL has only a limited engineering manpower capability and needs additional machanical, electrical, and reliability engineers, plus some laboratory technicians, to support the SSL Principal Investigators (PI's) who have inititated flight experiments. Several of these experiments are entering Phase D, during which the development, manufacture, and test of the flight-ready experiment must be completed. Most of the work will be performed either in other R&DO Laboratories or by an outside contractor. But it is considered essential that experienced engineers, technically strong in their fields, work closely and on a continuous basis with the PI's in SSL. Both the engineers and the PI will form a team to "live" with the flight experiment until it is completed.

4/23 JS

NOTES 4/22/68 GEISSLER

B 4/29

1. J-2S for Cluster I: The incorporation of unmanned rendezvous into the LM/ATM mission significantly increases the operations functions required of the launch vehicle. The scheme inherently depends upon two major factors: (1) The ability to vary the IGM time-to-go to provide a properly phased transfer ellipse, and (2) The incorporation of a second burn capability in the S-IVB stage with a total impulse requirement of approximately 800,000 ± 150,000 lb.sec. The guidance task is not excessive. The unresolved questions are largely related to what hardware modifications are necessary to implement unmanned rendezvous. Some of the alternatives are: (1) It is possible to restart the S-IVB J-2, but the combined total weight of added propellant, pressurant, boiloff, and associated hardware at first burn cutoff should not exceed 8,000 lbs in order to preclude payload degradation. (2) A second posibility is the incorporation of S-IVB strap-on solids. This scheme has been evaluated previously but without thrust termination. (3) Also possible is incorporation of improved J-2 (J-2S) operating features including providing for improved first burn performance and minimum weight penalty second burn. (4) Finally there is the simple alternative of placing the LM/ATM in the proper phasing orbit and using the LM propulsion system for circularization. Only the J-2S seems more closely related to design than improvisation and is addressed to the problems of new Earth Resources Experiments, higher inclination orbits, assuring greater OWS utilization, increased payload capability, development of a standard unmanned rendezvous technique, etc. The J-2S approach appears to be expensive primarily because for one mission, mass production is usually implied, so why not retrofit a customized R&D engine? The simplest most direct approach should be the cheapest. A design change is necessary to meet the new requirements and ground rules should not eliminate the right one.

E.G. Don't get the message. What do you propose to do?

B

2. National Academy of Sciences (NAS) Organizes Crossed-Beam Technology Review: NAS has charged its Panel on Remote Atmospheric Probing, RAPP, with the organization of an in depth review of the national research effort in pertinent remote probing methods. The panel is interested in methods for studying the earth's atmosphere from the ground to the turbopause (approx. 100 to 110 km altitude). RAPP's second technical meeting is scheduled for May 16-18, 1968, in Chicago. Dr. Davis Atlas, RAPP chairman, has decided to devote one entire morning session to the review of crossed-beam technology, and has asked Dr. A. J. Montgomery (IIT Research Institute) to organize this session. Attendance at any topic review is restricted to the panel members and 6 to 10 active researchers in the forefront of their fields. Dr. F. R. Krause, of our Fluid Mechanics Research Office, was invited to join Dr. Montgomery in the review of crossed-beam technology. Dr. Morris Tepper, Director of Meteorology, OSSA, indicated previously that the recommendations of NAS will be very important in establishing priorities of NASA remote atmospheric probing efforts.

NOTES 4-22-68 GRAU

4/23 7 5 B

B 4/23

1. QUALITY TRAINING: Another Quality Requirements seminar, consisting of 25 people, is being conducted at KSC from April 16 through April 25. To date, 130 people at KSC have undergone this training. A considerable cost savings has been realized by sending our instructors to KSC instead of having the attendees come here. ✓

2. 063 MATERIAL PROBLEM: NAR has located and established a traceability system to track all 063 material that was shipped to LAD from Kaiser, which covers a period from February 1967 through January 1968. Approximately 70% of this material is still at LAD and the balance is located between Seal Beach, Rocketdyne, and El Toro. Except for a few isolated parts located at Rocketdyne and El Toro, each piece of raw material or part has been classified as to its nominal maximum grain size. In addition, NAR is in the process of generating an MR action on each part fabricated from 063 material, and is providing redundant identification and traceability information on each part by the addition of a decal and chemically etching the basic part identification nomenclature. ✓

NOTES 4/22/68 HAEUSSERMANN

4/23 XD

1. ATM Transporter. Reference Notes 4/1/68 Haeussermann. Referenced notes indicated a potential schedule slip of the ATM transporter due to the problem of getting contractual coverage. We have resolved this problem by deciding to build the item in-house (Test Lab). ✓

2. Unmanned LM Docking and Alternate ATM Mission. During several meetings in the past two weeks, MSC personnel have brought up Mr. Mathews' temporary decision to provide the LM with a probe while on the launch pad if the CSM successfully docks to the cluster. If the CSM could not dock or want to be docked to the OWS for any reason, the LM would have a drogue installed and the LM would be docked to the CSM. However, if the LM has a probe installed on the launch pad and the LM cannot dock to the OWS, there would be no means for the CSM to dock to the LM since both would have probes. There could be some solutions to this problem, e.g., the astronauts could install a probe in the MDA after the CSM docking. A drogue in the LM would allow docking of the LM to the CSM or cluster. The reasons a probe has not been considered for installation on the MDA prior to OWS/MDA launch are that MSC believes that the probe cannot withstand the long time of space environment exposure and the probe presents a physical interference to the SLA. Several MSC personnel have expressed concern about the direction NASA Headquarters personnel have taken on this subject and we are also very much concerned. The ATM PI's would also be concerned if they knew their science was to be based on the success of the unmanned rendezvous and docking without any alternate mission possibility should the new rendezvous or docking scheme fail. This subject will be further pursued with the R&DO/IO elements involved.

Jim Shepherd AAP Office once promised me a briefing on the probe drogue exchange problem with models. What ever happened to that plan? JB

3. Retirement - Mr. Isaac Whitson. Mr. Isaac Whitson, electronics technician in the Guidance and Control Division, will retire on April 26, 1968 after 42 years of government employment. He spent 31 years in the Army and came to this Division in September 1956. His 42 years of service make him the senior employee at MSFC from the time in service viewpoint. I will give him a letter of recognition for his service and you may want to give him some form of recognition as well. ✓ I did JB

NOTES 4/22/68 HEIMBURG

B 4/29

4/23/68

S-II-5 (MTF)

Cryogenic proof test was delayed until later part of next week, or April 26, 1968, due to delays in getting vent valves back and installed. One crack, .075 inch across and .050 inch deep was found inside fuel tank. NAA wanted to ignore it, but R-P&VE demanded that it be ground out which was accepted by NAA.

S-IC (MTF)

The S-IC-6 stage acceptance test has been delayed approximately six weeks while single engine tests are being conducted to determine how the five-cycle oscillations in the pump may be alleviated.

S-IB (MSFC)

Preparations were made to conduct the acceptance firing test, SA-54, on stage S-IB-11. Test SA-54 is scheduled for April 23, 1968.

S-II STRUCTURAL TEST PROGRAM

The test programs on the F-1 and J-2 in support of 502 problem solutions can be accomplished by R-TEST, but only by lowering the priority of the S-II Structural Test Program. R-TEST does not have left the manpower capacity (mechanical, electrical, or measuring) to fire the S-IC-T. If the S-IC-T is to be used at MSFC, these people must be provided (Boeing and GE) from MTF to fire it. It would appear more reasonable, time wise, to do the S-IC-T at MTF if really necessary.

B 4/22

NOTES 4-22-68 HOELZER

4/23 9:00

1. ACCEPTANCE TESTING OF THIRD GENERATION COMPUTER SYSTEM: Acceptance of Phase I of the UNIVAC 1108 computer system began on April 17, 1968. In turning the system over to NASA for beginning of acceptance, UNIVAC recognized the failure of the system to meet certain contractual requirements. The major of these are (1) checkpoint/restart, (2) the number of jobs running simultaneously, limited only by hardware (present limit is two), and (3) accounting information on component usage (documentation needed in order to process this information is not presently available). These requirements must be met before acceptance can be successfully completed. UNIVAC expects fulfillment of these requirements within the next 30 days. NASA began acceptance by performing serial processing of FORTRAN and COBOL jobs at the Central Site (Building 4663). Serial processing will next be attempted from remote sites. This will be followed by testing of multiprogramming with job submission first at the Central Site and later at remote sites.

2. REDSTONE SCIENTIFIC INFORMATION CENTER: Budgetary limitations within MICOM and slippage of software for the third generation equipment have necessitated a reduction of manpower assigned to the RSIC on-line computer system for the remainder of FY 68. No impact on current operations is anticipated. This cutback of manpower will, however, stretch out the schedule for implementation of the planned on-line system for RSIC.

NOTES 4/22/68 JOHNSON

4/23 FD

B 4/24

Supporting Development Quarterly Review - Houston -- Re my notes April 8, 1968, (copy attached). Plans for the MSFC participation in this meeting are becoming quite firm. The MSFC discussions will center around the subsystems and technologies developed for the Saturn and being extended for the Orbital Workshop and ATM-A. Mr. George Hobson of P&VE will present work currently underway in thermal analysis and thermal control systems. Mr. Gilbert Gassaway of Astrionics Laboratory will do a summary presentation in the area of data management systems. A presentation on power systems will be made by a member of the Experiments Office staff. It will be based on material developed by Astrionics Laboratory. Unfortunately, because of lack of available manpower, it was not possible for Astrionics to provide a presenter and participant in the meeting in this area of activity.

OTDA Supporting Research and Technology Program in FY 69 - The proposed FY 69 Supporting Research and Technology Program to be conducted under the auspices of the Office of Tracking and Data Acquisition has been developed, reviewed, and submitted to Headquarters. The program is about equal in dollar scope to last year's program. It is to some extent a continuation of work begun last year and will reflect contracts and expenditures for equipment amounting to about $400,000. Conversations with OTDA personnel indicate a willingness to support the Center in a continued effort at this level and a high degree of acceptability of the work which we are doing for them.

Briefing on Materials Processing in space - We very much appreciated the comments and direction which you provided during the briefing by Mr. Wuenscher on April 16. This office, together with ME and the Materials Division of P&VE, will begin a more systematic program of contacts with, hopefully, interested elements in industry and the universities. Limited travel is planned this week to National Bureau of Standards and to Westinghouse to discuss two potential experiments in this general area of research. The experiment from the National Bureau of Standards is quite basic research dealing with the preparation of crystals and the effects of zero g on their processing.

NOTES 4-22-68 KUERS

1. Support to the Department of Defense:

a. Navy: In June 1967, Commander C. E. Stalzer, Industrial Officer, Naval Air Engineering Center, Philadelphia, Pa., visited our Electronics Development Branch to witness and analyze the application of the magneto-motive hammer system. He had in mind its possible use in swaging steel alloy terminations to steel wire rope used in the aircraft arresting gear aboard aircraft carriers. Sometime later, Commander Stalzer sent us engineering drawings of the cable termination. Our calculations indicated that it might be possible to swage these terminations or ferrules to the wire rope using the 240,000 joule capacitor bank and a practical program was started to swage scaled down models of the terminals. The preliminary test using existing swaging coils was better than expected; however, in swaging the steel terminals, we destroyed one of the coils. This indicated that to work the samples required more energy than the coils could safely stand. Our preliminary findings were reported to Commander Stalzer and at the same time his offer to supply four actual terminations and wire assemblies was accepted. These will be used to design a swaging coil and to test it.

b. Army: Sometime in the past, Mr. A. D. Chandler, TOW System Engineering Division, US Army Missile Command, contacted us regarding the use of intense magnetic fields in TOW production. The TOW missile is a Tube launched, Optical tracked, Wire guided missile produced by Hughes Aircraft of Tuscon. As a result, R-ME served as consultants with no active participation in the project; however, we cooperated in technical consultations to expedite the project. The equipment that was purchased by Hughes was the "Magneform" machine manufactured by General Dynamics. This is a good piece of equipment but did not lend itself too readily to the production requirements of the TOW missile. In a meeting with Hughes people in Nov 1967, we suggested modification of the equipment; e.g., the use of multi-conductor cable, coil designs, and certain safety features and practical details. Since then, we have had several conversations with Mr. Chandler about various phases of this project. The development of a practical magnetomotive forming process has now been achieved in the production of the TOW missile and our laboratory has received a very gratifying letter of appreciation from the TOW project.

2. KSC Crawler Cylinder Repair: The modified (sleeved) cylinder bore was machined and honed to a 12 micro finish. Also the modified piston head was chromium plated and ground to proper tolerances and finish. Finally, the whole hydraulic cylinder was assembled and turned over to R-QUAL for hydraulic test last Saturday.

3. Thermal MDA Test Unit: Reference your question to my NOTES of 4-8-68, copy attached for DIR and R-DIR. The unit is referred to as the "Football" because of its oval shape resembling a (pretty big) football, resulting from welding two full-size quarter panels together with two flat end closures.

4. Neutral Buoyancy Test Tank: We have now installed two sections of the Orbital Workshop in the new large tank and are proceeding with further sections. Because of the small amount of headroom between the top of the tank and the roof of the building large items of hardware have to be broken down into small sections and then reassembled under water. New underwater assembly techniques have had to be developed and were used for the first time in this operation.

NOTES 4-22-68 LUCAS

B 4/29

4/23 (L)

1. PARTICIPATION IN ZERO "G" KC-135 FLIGHTS: Reference your question on Lucas Notes 4-8-68, item 6. Special arrangements can be made for you to participate in a KC-135 zero "g" flight. You will have to complete a special physiological training course at Wright Patterson Air Force Base (WPAFB) of the type provided for Dr. Mueller and Dr. Shea (approximately 4 hours including altitude chamber ride). WPAFB is presently assessing what exact arrangements will be necessary and will let us know by next week. For your information, the standard checkout requirements as governed by AF regulations for eligibility to fly zero-g flights is attached. (Attachment No. 1)

2. S-II STAGE MATERIAL (-063): Reference your comments on Lucas Notes 4-1-68 and 4-15-68. The requested two-page reply prepared jointly with the S-II Program Office is attached. (Attachment No. 2)

3. S-II PREVALVES: A meeting between North American Rockwell (NR) and MSFC personnel was held last week to discuss the latest vibration failure of the Los Angeles Division/NR (LAD) LH_2 valve and the course of action. We have agreed to fly the LAD valves on S-II-3 if they become qualified in time. We have much greater confidence in the Parker design, which is now also undergoing relatively smooth qualification testing. We are pressing as hard as possible to have the Parker prevalves on the stages at the earliest possible date. The present production schedule shows an AS-504 availability.

4. SATURN I WORKSHOP FLAMMABILITY: For some time we have known that we were more stringent than MSC in selection of materials for Crew Bay areas. Recently, we have received a proposed AAP Nonmetallic Materials Control Directive which gives final responsibility for selection of such materials to MSC. The directive references an MSC specification which is a revision to MSC-A-D-66-3. MSC has used MSC-A-D-66-3 for Apollo Crew Bay materials. As an example of the laxity in this new document, selected area use of materials which burn downward at a rate of 18-inches per minute are approved. Should this directive be made official, we will lose control of the non-metallic materials used in all workshop crew bay areas. We are opposing the issuance of this directive.

Bill L
What action if any have you taken or do you want me to take?
B

5. MDA REDESIGN STUDIES: We are working on answers to the action items of the MDA task force meeting regarding operation of biomedical experiments in the MDA prior to entering the Orbital Workshop and inclusion of earth sensing experiments in the MDA. We made a preliminary evaluation of Orbital Workshop thermal conditions with the Cluster "misoriented" to perform earth sensing experiments (X-POP with Z axis vertical) and found that with heat loads in the Orbital Workshop due to lights and fans only during misorientation, the crew can reenter the Orbital Workshop at any time after performing earth sensing experiments in the MDA.

6. X-15: The next X-15 flight is scheduled for 4-25 or 4-26 (tentatively) depending on the weather. Primary mission will be S-II insulation evaluation. We will have dual camera coverage; calorimeters will be in optimum position and we will have better overall instrumentation than on the previous flight where insulation was just put on as a passenger in a flight for other purposes and not planned for appropriate insulation environment.

* Attachments No. 1 and No. 2 for Dr. von Braun and Mr. Weidner only.

STANDARD REQUIREMENTS FOR PARTICIPATION
IN KC-135 ZERO "G" FLIGHTS

April 19, 1968

1. PHYSICAL EXAM: An Air Force Class III physical must be administered by an Air Force Flight Surgeon on active duty.

2. PHYSIOLOGICAL TRAINING: Subject must receive the USAF Physiological Training Program (Jet Passenger Phase) as prescribed in AF regulation 50-27. This course consists of eight hours classroom training and approximately four additional hours to complete indoctrination inside the altitude chamber. Subject will receive AF form 1274 (7-65) upon completion of the course.

3. SURVIVAL TRAINING: Subject must receive an original survival training course which consists of a 6-8 hour lecture on bailout procedures and ground survival. This is usually taken at WPAFB just prior to the subjects zero "g" indoctrination flight.

4. GROUND EGRESS TRAINING: A brief document entitled "Emergency Procedures" is available which describes Ground Egress Procedures. This should be studied by the subject who is required to be tested on contents of the document prior to his first flight.

5. INDOCTRINATION FLIGHT SCHEDULING: Upon satisfactory completion of the above, flight orders will be cut by the zero "g" office at WPAFB to allow individual to be scheduled for an indoctrination flight. Subjects clearance must be wired to WPAFB before flight orders can be processed.

6. CENTER RESPONSIBILITY: The Engineering Analysis Section, R-P&VE-VAE, has established interfaces with the above defined organizations and schedules and coordinates this total training program.

ATTACHMENT No. 1

B 4/29

REFERENCE: Comments on Notes 4-1-68 Lucas

Because of the early rib cracking problem experienced in forming and handling the S-II cylindrical quarter panels in the summer of 1966, NR proposed to procure a "special" 2014 material with increased elongation in the short transverse grain direction. A survey of the industry was made by NR and they were informed that General Dynamics had been successful in improving 2024 material in the short transverse grain direction by pre-forging the billet prior to rolling the plate material. On this information, NR developed Specification MB0170-063 which was approved by MSFC in May 1967. Also, a contract change was made to include this specification in the S-II CEI Specification. Using this specification, NR procured pre-forged 2014-T6 material from both Kaiser and Reynolds. (A subsequent labor dispute at Reynolds precluded additional procurements from them).

The NR evaluation of the Kaiser material, made in the June-July time frame, did not include an investigation of the grain structure in the material. The evaluation did show reduced strength in the longitudinal grain direction, but Kaiser assured NR that they could overcome this by chemistry adjustments in the alloy. On that basis, material for vehicles 511 through 515 was procured in July 1967. Early machining and forming operations (October 1967) with this new material indicated a recurrence of the old rib cracking problem. NR was not concerned at first, since they believed the cracking due to minor forming problems. Evaluation of one crack in our laboratory, in late December 1967, resulted in the discovery of the large grain material. By memo, dated January 3, 1968, the stage manager was notified of the P&VE concern over the susceptibility of this large grain material to stress corrosion. A subsequent check of the -063 material at Seal Beach, made jointly by NR and P&VE personnel, showed that essentially all of the -063 material did contain the large grain structure.

A decision to purge the -063 material from S-II production was not made at that time since NR did not share the P&VE concern over the large grain material. Therefore, a test program was developed jointly by NR and P&VE to evaluate the -063 material. Concurrent with this, NR was directed to procure one ship set of 2014 material to the specification used for previous stages, MB-0170-021. Furthermore, a detailed production schedule evaluation was made to determine the date on which a final decision on use of the material would have to be made. This date was predicated on the receiving date of the -021 material and the production schedule. As a result of this examination, it was determined that a final decision was required no later than April 25, 1968.

ATTACHMENT NO. 2

Based on test data now available, the stress corrosion susceptibility of the -063 material is confirmed. Therefore, to replace the -063 material will result in a two week schedule impact to S-II-10, (a few S-II-10 components were fabricated using the -063 material when the supply of -021 was exhausted), eight weeks to S-II-11 and three weeks to S-II-12. S-II-13 and subsequent will not be affected. NR has estimated that $15M will be required to accommodate the large amount of premium time required to keep this impact from increasing. A level I action with headquarters to implement the necessary changes is forthcoming.

W. R. Lucas
William R. Lucas
Director, P&VE Laboratory

for F. Edward Williams
Roy E. Godfrey
Manager, S-II Stage Office

CONCURRENCE:

Arthur Rudolph
Arthur Rudolph
Manager, Saturn V Program

Bill Lucas

Is the $15 M figure the total loss caused by the need to reorder material, or only the loss for premium needed to protect schedules?

B

NOTES MAUS 4/22/68

FY-70 Apollo Funding: In the MSF "markup" of our POP 68-1 the Apollo Funding for FY-70 was reduced by $140M as reported in my notes of March 25. However, on April 17, Jerry Kubat, by letter increased the MSFC Apollo allocation for FY-70 by $30M. A letter to MSF is being prepared for your signature to put on record our concern for planning to minimal ceilings at this time.

Institutional Minimum Base Study: Subsequent to the meeting you attended last week we worked with Mr. Gorman and Mr. Kubat and have developed the following major guidelines for the minimum base study:

1. Due to the short time limit the Silo Study you suggested is being uncoupled from the minimum base study - at least for the time being.

2. The base will consist of currently planned IB and V vehicles. Manufacturing and assembly capability for vehicles beyond SA 515 and SA 214 will be phased out.

3. Civil Service and Contractor capability will be retained to launch from inventory one vehicle per year - either a IB or a V.

4. Civil Service Manpower distribution thru FY-72 retaining a current ceiling of 6506:

Program Management	Decrease	50%
Administrative Support	Decrease	10%
R&D Indirect	Decrease	10%
R&D Direct	Increase	22%

5. Funding in FY-72 in rough order of magnitude:

Administrative Operations	$125M
R&D for launch of one vehicle per year (from storage either IB or V)	$220M
R&D for ART/SRT effort	$ 60M
Approximate total MSFC Annual Funding	$405M

A review of the study results with MSF (Kubat) and other Centers is scheduled at MSFC on May 1 and 2.

B 4/29

NOTES 4/22/68 RICHARD

4/23 PM

No submission this date.

NOTES 4/22/68 RUDOLPH

4/23 (P)

B 4/25

AS-503 Semi-DCR/AS-502 Evaluation:

Performing the in-depth analysis of the AS-502 flight anomalies and the determination of preliminary engineering resolutions in the short time between the launch on Thursday, April 4, and the Sunday, April 21, meeting with Dr. Mueller was an outstanding accomplishment by MSFC and its contractors. ✓

This morning, I simply want to express my thanks to you and all of the people at MSFC for the dedicated efforts that have gone into the last 2-1/2 weeks. I especially want to thank: Dr. Lucas, Ludie Richard, Jim Lindberg and the Flight Evaluation Working Group, and all their fine Government and Contractor supporters. ✓

NOTES - 4/22/68 - SPEER

B 9/20

1. AZUSA-GLOTRAC MISSION SUPPORT: The use of Azusa transponders currently authorized by OMSF extends through AS-503. DOD continued Azusa/Glotrac support for Titan III and Apollo through FY-68 without requiring special funding by NASA. We have been requested to re-examine the requirement of Azusa/Glotrac for Mission support beyond July 1, 1968, and advised that any support required would result in MSF becoming sole user at that time (estimated 1.5 million dollars per year). We are in agreement with R&DO that there is no mandatory requirement for continuing this support beyond that provided for AS-502 since the principal R&D objectives in the use of this support for Saturn V have been met. An official reply is being prepared and coordinated.

2. AS-503 MANNED FLIGHT MISSION RULES: A review was held on Thursday and Friday of the AS-503 Manned ("D" Mission) Preliminary Flight Mission Rules. Although R&DO participation, in particular, was necessarily limited due to the AS-502 related activities going on in parallel, a good start was made on the rules. DAC and IBM participation and input of S-IVB/IU rules was good. It is apparent that the mission rules and associated contingency planning for this complex and manned mission will require a much larger effort than that effected on any previous mission. A great deal of work remains to be done. A particular area that will be given close attention is the interface between the MCC launch vehicle flight controller rules and the manual EDS and orbital operations procedures for the crew.

3. FLIGHT CONTROL OFFICE: In a meeting on April 15 at MSC, we reviewed with Chris Kraft the staffing needs of our Flight Control Office at Houston in the light of the experience gained during recent missions. We agreed that a slight increase to a total of 32 (including contractors) is required and can be implemented (present strength is 27). Kraft reiterated his requirement for a small resident group assisting the AAP flight operations effort.

NOTES 4-22-68 Stuhlinger

B 4/20

4/23 PM

1. ASTRONOMY MISSIONS BOARD: I attended part of the Board meeting on 4/19 at which Dr. Newell presented his "Bench Mark Program" (copy attached). In essence, this program calls for a separation of large astronomy projects from the OWS project, and proposes that the OWS and astronomy "move towards a common destiny in the future." A lively discussion followed; Board members argued for a larger share of NASA's resources to be devoted to a vigorous space astronomy program now. Dr. Naugle, in a private conversation, commented that the Bench Mark Program appears vulnerable because in this program astronomy and earth resources would not support the OWS project as customers. It is not likely that OWS development work can go on for several years, well funded, without showing some potential returns to science and applications. ✓

Dr. Naugle also suggested that MSFC should begin some planning work for unmanned vehicles carrying heavy and large scientific experiments (astronomy, X-rays, gamma rays, cosmic rays, relativity) as a parallel activity to the OWS project. MSFC should expect to be asked in a few weeks for comments on the letter that Dr. Goldberg wrote to Dr. Newell on 3/22 on the subject of three major astronomical payloads to be flown not later than 1975.

Lin Shafer
Please
Coordinate
reply.
B

2. RESEARCH INSTITUTE FUNDING: We learned that a decision on the funding of the Research Institute through a Headquarters grant is to be expected in the near future. Probable funding level is two-thirds of that of last year. ✓

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

OFFICE OF THE ADMINISTRATOR

April 17, 1968

MEMORANDUM

Hans Mauer
FYI
(incl. attachm.)
B 4/29

TO : Members, Management Council
Planning Steering Group

FROM : AA/Associate Administrator

SUBJECT: Bench mark planning reference

Current planning activities for FY 70 are directed to developing a wide range of alternative program strategies and missions. The final overall plan ultimately structured by NASA senior officials and recommended to the Bureau of the Budget will necessarily settle upon a particular "mix" of these alternatives. Some of the alternatives that will be considered at the various steps of the decision process will be optimal alternatives; others may be minimal. The process, however, requires that alternatives be available and that they are brought within a range of realism.

As one of several devices for relating planning activities to a realistic prospect, I have listed elements of a bench mark plan for internal reference by those engaged in the planning process. This is attached. Other refined and revised listings may follow from time to time.

These bench mark items do <u>not</u> constrain the development of alternatives at higher or lower levels. They do, however, indicate a requirement for some alternatives at or below the bench mark levels.

Homer E. Newell

Attachment:
Bench Mark Program Elements - April 1968

BENCH MARK PROGRAM ELEMENTS - APRIL 1968

1) LUNAR - A) CONSIDER PHASE I ENDED AFTER FIRST 2 OR 3 LANDINGS (PHASE 1 INCLUDES RANGER, LUNAR ORBITER, SURVEYOR, AND APOLLO)
   B) PLAN TO REVIEW AND ASSESS WHAT HAS BEEN LEARNED AND WHAT FUTURE REQUIRES
   C) ASSESS NEED FOR MOBILITY - TYPE AND EXTENT
   D) ASSESS NEED FOR MANY SITES VS ONE SITE INTENSIVELY STUDIED

2) AAP - CONCENTRATE ON EARTH ORBITAL ASPECTS
   - SATURN V SHELTER (WORKSHOP) A MILESTONE - INTERMEDIATE TO A "SPACE STATION"
   - SATURN I-B PROJECTS SHOULD MOVE US AS QUICKLY AND SIMPLY AS POSSIBLE TO THE SHELTER
   - CONCENTRATE ON LEARNING ABOUT MAN, MAN/MACHINE RELATIONS, OPERATIONS IN SPACE, LOGISTIC PROBLEMS, ETC.
   - DON'T TIE IN EXTENSIVE OTHER PROGRAMS (SUCH AS ASTRONOMY) - KEEP THEM LOOSELY COUPLED TO PERMIT THEM TO MOVE TOWARDS A COMMON DESTINY IN THE FUTURE. DO ONLY SIMPLE EXPERIMENTS
   - DO ONLY WORTHWHILE EXPERIMENTS
   - SERIOUSLY REASSESS ATM IN LIGHT OF INVESTMENT, MERITS, SCHEDULES, ETC.

3) ASTRONOMY - HAVE TO WORK WITH - SOUNDING ROCKETS, OSO, OAO, SOLRAD RAE, SAS, ASTRA
   - IN REASSESSING ATM, CONSIDER ON-GOING PROGRAM (ABOVE) AND POSSIBILITIES IT OFFERS, LIMITED INDIVIDUAL EXPERIMENTS FOR AAP. DEVOTE PRESENT TO STUDY AND PLANNING BASED ON WHAT WE CAN LEARN FROM THESE ACTIVITIES

4) EARTH RESOURCES SURVEY - USE AIRCRAFT AND AUTOMATED SATELLITE MISSIONS TO DERIVE EXPERIENCE. CONSIDER MINIMUM AAP INVOLVEMENT TO EXTENT WARRANTED AND FEASIBLE.

5) PLANETARY - CONTINUE WITH PRESENT PLANS AS A PRIME ELEMENT IN SOLAR SYSTEM INVESTIGATIONS

6) NERVA - CONTINUE TO PUSH STATE OF THE ART - CONTINUE WITH FLIGHT ENGINE - NO STAGES, NO ROCKETS AT THIS TIME

7) LAUNCH VEHICLES (LARGE) - ASSESS CAREFULLY NEED FOR TITAN - SATURN I-B - SATURN V - DEVELOP A PROCUREMENT AND INVENTORY PROGRAM THAT WILL KEEP SATURN V ALIVE

8) AERONAUTICS - MAINTAIN THE CURRENTLY PLANNED PROGRAM

9) TDA - REASSESS DEEP SPACE NET NEEDS
REASSESS SUNBLAZER ANTENNA REQUIREMENTS

10) AO- MATCH THE PLANNING TO THE ABOVE AND MAINTAIN A VIABLE BASE FROM WHICH ONE COULD INCREASE ACTIVITY LATER

11) APPLICATIONS - EXTEND AS MUCH AS POSSIBLE

12) OTHER PROGRAMS - MAINTAIN A MODEST ACTIVITY LEVEL

NOTES 4/22/68 TEIR

B 4/29

SA-205 STATUS: S-IB-5 and S-IVB-205 were erected on April 15 and April 16 respectively. Due to high gusts of wind the IU and SLA were not erected until April 18.

We received word from KSC today that during a spacecraft facility hypergol flow test yesterday, a spillage of N_2O_4 hypergol on the outside of the Service Module/SLA area occurred. KSC hosed the area down with water and this flushing action caused some of the diluted fluid to enter the vehicle through openings in the SLA and vehicle skin. The extent of damage, if any, to the cabling and other launch vehicle hardware is not known at this time. We have asked P&VE to send some of their material personnel to KSC today to aid in the assessment of the damage. Our prime contractors will also be sending their material experts to KSC. We expect to receive a more complete assessment tomorrow morning.

OMSF MISSION DIRECTIVES: We have received word this week from Headquarters that Gen. Phillips has requested that his staff pull together the various details of the AS-205 mission and distribute them over his signature in the form of a mission directive. This directive will include considerably more detail than past mission directives in areas such as primary mission objectives, secondary mission objectives, abort and alternate missions, operational tests, and mission profiles. It is the intention of Headquarters that in the future the initial directive and subsequent revision will be issued six months and three months respectively prior to launch and that any of the items that the centers wanted to change that are contained in the directive will require Gen. Phillips' approval. We and MSC objected to this approach primarily because Headquarters is merely taking the center generated documentation and sending it back to us as Headquarters control information. This will work an undue hardship on the centers in trying to meet the mission planning dates for the various missions. From what we have been able to determine, the type of data that Headquarters intends to incorporate in the document usually changes during the final software generation cycle prior to launch. Headquarters buy-off on these changes could turn out to be disastrous to the schedules.

We understand that the centers will have an opportunity to comment on the directive prior to its issuance and I intend to make some specific recommendations on keeping it general enough so that we can meet operational flight requirements.

NOTES 4/22/68 WILLIAMS B 4/29

1. IB/Service Module:

In follow-up to our meeting Friday, April 19, and the discussion on the IB/SM, we found that Mr. Webb is not aware of the potential application of the IB for the '73 Mars Mission. I would suggest that the proposed presentation by Gen. O'Connor to Dr. Paine is very much in order for Tuesday, April 23. We have also provided a "bootleg type" copy of your letter into a channel that will find its way to Mr. Webb shortly.

2. Lunar Exploration Systems - Costing Study:

An inter-Center costing team has been established by Capt. Scherer to independently estimate RDT&E and other program costs associated with the various systems and missions proposed for the Apollo exploration era. The team is chaired by Mr. Franz Kretzman of Scherer's Office; MSFC is represented by Mr. John Stucker of Executive Staff. This team visited Marshall on April 15 and 16 to discuss the various systems which we have been investigating: lunar roving vehicles, lunar flying vehicle, unmanned cargo delivery vehicle, and the lunar drill. The team met the various MSFC project engineers (ASO, P&VE, TEST LAB) and discussed the current status of each project, its feasibility, its complexity, anticipated development problems, etc. This background information, plus that gained during planned industrial queries, will hopefully support the team's costing analyses.

The current Headquarters feeling seems to be that all cost estimates are optimistically low. Our current concern is that cost estimates which have been rather extensively developed (such as the roving vehicle costs) are not impulsively characterized with other less well-defined estimates, thereby unjustifiably pricing ourselves out of business.

April 29, 1968

NOTES
MR. GORMAN'S COPY
4/29/68

Hoelzer and Below
notes to U Box 4-29-68.

N

NOTES 4-29-68 HOELZER

AUTOMATION OF MEDICAL FILES: Your comments indicated concern regarding the proper control of information contained in the medical file. This file uses a unique control number, assigned by Dr. Frierson, to identify individuals. The cross-reference between employees' names and the medical control number is not in the automated system, nor available to individuals outside the MSFC Medical Center. (Copy of 4-8-68 NOTES attached.)

B 4/12

NOTES 4-8-68 HOELZER

1. AUTOMATED MEDICAL ANALYSIS SUPPORT: As a first step in the automation of medical records at MSFC, the scheduling and notification of NASA employees for periodic physical examinations is now being accomplished mechanically. Additional support areas have been studied, with the conclusion being that further research in the medical field is an important undertaking that could be accomplished with a five-man effort for one year. The work plan submitted was very well received by Management Services Office. They have a keen desire to mechanically massage the medical data of MSFC personnel in an effort to determine the incidence of various diseases and, hopefully, to attain the ability to detect at an earlier time the onset of disease or its symptoms. They feel certain that the statistics and data accumulated will not only be useful to the MSFC and NASA Occupational Health Program, but also will materially assist other medical research programs. The completion date for the work plan cannot be solidified at this time because of a lack of available manpower for assignment to this project. ✓

Harry S. I hope we are taking adequate steps to protect privacy of medical information B

2. EXPERIMENTAL STUDY: The Department of Interior, through cooperation with NASA, has sent Dr. Dahlem and his geological team from Flagstaff, Arizona to MSFC to conduct an experimental study using the Simulation Branch's Lunar Surface Vehicle Simulator. This was arranged by C. D. Carlile of R-ASTR-A. This study involves driving the vehicle simulator and making geological observations. The driver's descriptions are recorded on tape for future use and are also heard by two other team members who use the information to mark maps on an x-y plotter (which also plots position) and to code the information so it can be used in a digital program. This program is used on the Branch's 6050 digital computer which analyzes the data and recognizes patterns in the rock formations and terrain. This is an experimental study to determine the feasibility of using the MSFC simulator as an addition to field studies. An important part of the simulation is the use of an automated navigation system proposed by Mr. Carlile. The navigation system provides position information to the driver which can then be correlated with map coordinates. ✓

5-15-68

NOTES 4/29/68 BELEW

EARTH LOOKING/BIO MED EXPERIMENT INTEGRATION: This effort is proceeding satisfactorily with a status review planned for you on May 3 and the final review with Mr. Luskin on May 16. In general, the bio med experiments are to be located in the forward end of the MDA with those other experiments (such as Saturn I Workshop habitability) that have to be moved into the Saturn I Workshop, located toward the aft end. The earth looking experiments are being located in two locations: those that are of the photographic type are being located in MDA docking port No. 3 (such that they view along the local vertical when the cluster is rolled); and those that electronically scan are being located externally on an Airlock truss along the same line-of-sight as the photographic types. The requirements for both the bio med and earth looking experiments have been reviewed with MSC and our understanding of such is sufficient to perform a "first cut" compatibility analysis. In addition, McDonnell Douglas is assisting in the analytical work for those earth looking experiments to be located on the Airlock.

PERSONNEL: In support of a general Center concern over the seriousness of the high loss of good middle grade engineers, we are continuing to receive notices that now add up to a total of 12 1/2 percent over the past six months. The predominant concern of these people seems to be one of their future. If this is of major concern within the AAP area, it must be equally, if not more so, throughout the Center.

Over the last six months

12 1/2%	-	Engineers
40%	-	Business and Professional
16.6%	-	Total (including Business and Professional)

SATURN I WORKSHOP LIGHTING TEST: A lighting test was conducted April 17-18, in the Engineering Mockup to evaluate the lighting levels with new color schemes being proposed for the Saturn I Workshop. A report on the test results is in preparation.

INTEGRATED CREW OPERATIONS SCHEDULES: A meeting was held with Messrs. Palaoro/Johns/Vaccaro and others from P&VE last week to discuss the development of integrated schedules for astronaut participation in hardware development reviews. Lt. Commander Paul Weitz and Major Lloyd Reeder of MSC Flight Crew Operations Directorate are here today, April 29, to discuss the development of baseline schedules for astronaut participation in neutral buoyancy testing, zero "g" aircraft testing, task analysis facility testing, and computer simulation.

1 a. Weekly notes

NOTES 4/29/68 BALCH

S-II-4 Testing - X-ray and dye-penetrant tests on LH tank were completed on 4/27/68, with no discrepancies. Stage will be installed in the Vertical Checkout Building on 5/1/68 for incorporation of KSC mods. Latest information is that stage may be shipped to KSC on May 11th on vessel which returns S-II-3 to MTF.

S-II-5 Testing - Cryogenic proof-pressure test attempted on 4/26/68 was terminated approximately on hour after initiation of countdown and prior to loading of propellants. Shut-down occurred at approximately 3:00 p.m. because of loss of electrical power on the test stand when the first LOX barge pump was turned on. Power loss was caused by failure of time-delay relays on test stand sub-station. Faulty relays have now been replaced, and cryogenic proof-pressure test is now rescheduled for 4/30/68.

S-IC-6 Testing - Test activities have been suspended awaiting modifications for investigation of the type of pressure oscillations experienced during the SA-502 flight. No firm test schedule is yet available, but indications are that test activities will be resumed in late May and completed in early July.

GE Service Contract - The NASA-developed prenegotiation position for the providing of general support services by the General Electric Company from 7/1/68 to 9/30/69 was submitted to MSFC for approval on 4/24/68.

Legal Affairs - Information has been received that MSFC General Counsel has denied the claim of Mr. C.M. Lumpkin of Carriere, Mississippi, for damage to his home allegedly caused by the S-IC-5 static firing at MTF on 8/25/67.

Public Affairs - A Photographic Workshop was held on 4/20/68 by the MTF Photographic Laboratory to acquaint individuals and organizations in the photographic field with the techniques, facilities, and scope of photographic work carried on at MTF. Seventy persons attended, representing commercial, military, and free-lance photographic organizations from Mississippi, Louisiana and Georgia.

NOTES 4-29-68 BROWN

H-1 ENGINE The H-1 engine vented bellows LOX shaft seals were inspected after the successful full duration static firing of S-IB-11 on April 23. All eight seals were in good condition. The LOX seal drain line temperature sensing system performed properly. The engines are being reassembled with the same seals installed. New bellows seals will be installed in S-IB-12 prior to static test, and inspected after the long duration run.

F-1 ENGINE Rocketdyne has formed a team to study the longitudinal oscillation problem encountered in Vehicle Flight 502. The team, headed by Dr. E. W. Larson, possesses considerable experience in the analysis of Vehicle POGO oscillations. To date, this group has reviewed available data from Vehicles 501 and 502, POGO test programs previously conducted at MSFC and POGO analysis on other vehicles, including: (1) Thor Agena (2) Atlas Centaur (3) Titan. An evaluation of several corrective actions to alter propellant feed system dynamics is being considered. In addition, an engine system test program has been formulated. The testing will be conducted at Edwards using engine F-4028, a Qual I type engine similar to those on S-IC-3. (The engine is being supplied as GFE.)

J-2 ENGINE Evaluation of possible failure modes applicable to the AS-502 anomalies is continuing. A test was conducted Sunday, April 28, to simulate failure of the ASI (Augmented Spark Igniter) fuel line down near the main fuel valve. (The test reported last week simulated failure in the dome area near the ASI.) Preliminary information indicates that the engine experienced a self-induced, LOX rich cut-off approximately 100 seconds after line failure and that the engine sustained major damage.in the combustion area of the main chamber. The ASI was also damaged.

The contamination (sand) in the J-2 engine helium filters on S-II-3 is currently being reviewed by Rocketdyne. Preliminary reports indicate that the particles found in the helium filters are not excessive; therefore, corrective action may not be necessary.

GENERAL I will be accompanying Dr. Mueller at Rocketdyne today (4/29). He plans to review:

(1) F-1: POGO analysis and test program; softening of engine shut-down.

(2) J-2: Findings on AS-502 and hardware fixes; engine shake table and hardware.

(3) LEM Ascent Engine - Review of injector program.

Messrs. Kubat and Mitchell from NASA Hq. will be at MSFC on May 2 for a briefing on Rocketdyne retrenchment. As a follow-up to an earlier visit, they will be at Rocketdyne on May 8 to review planned facility retrenchment.

NOTES - 4/29/68 - CONSTAN

VISITORS TO MICHOUD

On Monday, April 22, 1968, Dr. Thomas O. Paine, Deputy Administrator, NASA, Col. Clare F. Farley, Executive Officer, Mr. James Long, Assistant Executive Secretary, Mr. Harold Luskin, Deputy Associate Administrator, Technical, Mr. Bob P. Helgeson, NASA Safety Director, and Dr. Charles D. Harrington and Mr. Carl R. Praktish, member and executive secretary respectively of the Aerospace Safety Advisory Panel (all of NASA Headquarters); Mr. Charles J. Donlan, Associate Director, Langley; accompanied by Dr. von Braun, Mr. Neubert, General O'Connor, and Mr. Shepherd of MSFC, were given orientation briefings by Mr. Stamy, NASA; Mr. Gunning, Boeing; and Mr. Lowrey, CCSD; after which they were conducted on a tour of the facility.

NOTES 4/29/68 EVANS

Nothing of special significance to report - Safety

NOTES 4/29/68 FELLOWS

Internal Communication Research: On April 18, Mr. Weidner was briefed on results of a recent research study into internal laboratory communication. The research was conducted in two R&DO laboratories from November 1967 through February 1968, by Mr. Gary Richetto, a doctoral candidate from Purdue University. The work was performed as part of the projected five-year communication improvement plan initiated in FY-66 by Walt Wiesman. In conducting his research, Mr. Richetto identified a number of problems of particular concern to management. These included instances where present methods of conveying information between management and subordinate organizational levels were demonstrably ineffective. Various mechanisms were also singled out which contributed to breakdown of the credibility of the information disseminated within the laboratory. These findings are of great interest because the research was coincidentally done at the same time that the Center was undergoing the RIF. Mr. Weidner has asked that the presentation be repeated for the May R&D Council, so that Mr. Richetto's overall conclusions may be disseminated to all R&DO management. If you would like to hear these, a summary briefing can be arranged.

NOTES 4/29/68 GEISSLER

1. Preliminary Design Analysis for Incorporation and Early Conduct of Critical Biomedical and Candidate Earth Resources Experiments in the MDA: This laboratory is participating in a center-wide effort to accomplish subject task. Preliminary indications are that the experiments requirement can be met without changing the size of the MDA. Certain internal combination changes must be made and some windows will have to be relocated. Seven earth resources experiments are being considered and all appear to be individually compatible with the AAP-2 capabilities. An already existing WACS control mode (X-POP with roll at the orbital rate-MDA port 3 is toward the earth) can be utilized to accommodate the pointing requirements. Power requirements are so demanding that the OWS will have to be evacuated during this mode of operation unless fuel cell power can be made available from the CSM. Efforts are now under way to derive a mission at an orbital inclination of 29° and 35° which can accommodate the experiments' total operating requirements. Included in this effort will be lifetime considerations, ground coverage, payload vs weight, launch opportunities, rendezvous impacts, thermal impacts, etc.

2. Third National Conference on Aerospace Meteorology, New Orleans, May 6-8, 1968: Mr. William W. Vaughan of our Aerospace Environment Division is Program Chairman of this conference. It is sponsored by the AIAA, American Meteorological Society and Institute of Environmental Sciences. The conference is an interface between the engineering application and technical studies of the environment. About 70 papers will be presented on space vehicle response, satellite interactions, atmospheric studies, simulation problems, and related topics. MSFC has six papers in the conference. Our previous participation in these conferences has been most worthwhile to our space vehicle and satellite studies. MSFC maintains an excellent image and level of contribution to the engineering and technical community in this subject area.

3. ATM Experiment Requirements Capability: For the past few months, Martin-Denver has been performing a compatibility analysis of ATM Experiments Requirements. Study objective is to determine the possibility of reducing overall mission time requirements by operating certain ATM experiments simultaneously. Study has been iterated several times since mission constraints and experiment requirements change. Interim study results were discussed with members of ASTR, P&VE, S/AA, and MSC. Results were also presented to Dr. Mueller at an ATM Review. These studies and discussions indicate that the requested ATM experiments can be accommodated if the experiments are compatible, and can be operated simultaneously as assumed in the study. Meetings between ourselves, Martin, and the PI's are planned for April 24-26 to verify that we have properly interpreted the PI's requirements and that the intended simultaneous operation does not violate the inherent experiment constraints.

NOTES 4-29-68 GRAU

1. J-2 ENGINE PROGRAM: The electrical and mechanical functional checkout of engine J2131 (on which we have performed Quality Maintenance tear-down inspection and analysis in our facility) has been completed. No major discrepancies were noted.

   Based on the suspected problem with the ASI Lox/Fuel line on 502, this line was removed from engine J2131 and subjected to pressure and external leak tests. The line is composed of two units. Testing was performed with the units connected together and the test pressure was limited to the maximum allowable proof pressure of the weaker unit. The line passed both pressure and external leak testing.

   - The "deep etch" problem on the ASI line which was discovered at MDC last week has diminished in significance. It has been found that etching was only .03% of the minimum wall thickness of the tube as opposed to 10% as originally reported. Rocketdyne still plans to take action to preclude the possibility of future "deep etching".

   - Rocketdyne continues to investigate the reported ASI Lox/Fuel line failure on AS-502. A representative of this Lab is participating in an MSFC "tiger team" which has been at Rocketdyne for two weeks following Rocketdyne's investigation. While simulating an ASI line failure, Rocketdyne was able to duplicate a 23 p.s.i. chamber drop similar to that observed on S-II-502, #2 position. The team has found that Rocketdyne has not been following the traceability procedures in all cases.

2. VEHICLE SYSTEMS FAILURE ANALYSIS: For several years this Laboratory has conducted a Vehicle Systems Failure Analysis task using test and flight failure data from numerous vehicles such as Redstone, Jupiter, Saturn, Atlas, Titan, Ranger, Mariner, etc. The purpose of the task is to identify those systems or types of components which have significantly higher, broader failure histories, and to reorient testing and checkout accordingly if necessary. As a result of our request to Jet Propulsion Lab for release of satellite failure data, NASA Headquarters personnel (KR) have become interested in this effort. Mr. Moskovitz (KR) has requested a technical presentation in Washington on April 30, 1968. We plan to make the presentation in the vein of a progress report, pointing out some indicators, since the task is not yet finalized.

3. S-IVB-505N: A special cold helium leak test will be conducted on this stage May 1, 1968, to obtain information for the investigation of the suspected cold helium leak on SA-502. The lox and fuel tanks will be loaded to 100% levels and the cold helium bottles pressurized to 3000 p.s.i.a. Propellants will be off loaded and the bottles blown down to simulate the first burn. Checks will then be made for helium leaks.

NOTES 4/29/68 HAEUSSERMANN

1. AS-205 Damage Due To RCS Spillage. An inspection at KSC of the AS-205 vehicle was made on Tuesday 23 April to assess possible damage due to nitrogen tetroxide spillage and the subsequent washdown with water while on Pad 34. A team of Quality, P&VE and Astrionics Laboratory personnel made the inspection of the IU which revealed only minor damage to four IU cables. The recommendation to KSC was to replace these cables. Three cables interface the IU with the Apollo Spacecraft and the other cable interfaces the IU to the S-IVB. Wednesday morning, IBM reported seepage of acid and minor paint damage around the C-Band antennas and other antennas on the IU. IBM was going to remove these antennas and examine them for damage.

NOTES 4/29/68 HEIMBURG

F-1 ENGINE

Preparations are being made to conduct a series of POGO tests on the West Area F-1 Test Stand to investigate the S-IC POGO problem experienced during the 502 flight. First firing is scheduled for May 7, 1968.

S-IB (MSFC)

A 145-3 seconds test, SA-54, was conducted on stage S-IB-11 on April 23, 1968. Inboard engine cutoff was initiated by fuel level sensors and outboard engine cutoff occurred upon timer command, three seconds after inboard engine cutoff. The test was successful and no hardware or stage damage was incurred. Following normal post-test turbopump preservation procedures, all eight lox pumps were opened for in-place carbon seal inspection. All seal carbon nose surfaces again exhibited the glazed appearance previously encountered, but no abnormal seal chipping occurred. The pumps were then reassembled and operations started to have the stage removed from the Static Test Tower East on May 3, 1968.

S-II (MTF)

S-II-4 - This stage is presently in the Vertical Checkout Building at MTF undergoing modifications and tank inspection. LH_2 tank inspection was completed on April 26, 1968. Cleaning and closeout are scheduled for completion on April 30, 1968. The ship date to KSC with the 30 day extension is May 25, 1968.

S-II-5 - An unsuccessful attempt was made to perform a cryogenic proof pressure test on S-II-5 on April 26, 1968. The test was aborted at approximately 2:45 pm, due to the failure of a D.C. power rectifier on Test Stand A-1. The rectifier failed after the stage propellant tanks were preconditioned and LN_2 pumps start command given for cryogenic loading. Cause for the failure was not immediately determined. The test has been rescheduled for April 30, 1968.

S-IVB-505N (SACTO)

S-IVB-505N is installed on the Beta III Test Stand at SACTO. A propellant loading test is scheduled to be performed on May 1, 1968. Special test will also be conducted to determine the cause for cold helium gas leakage. A complete post-static checkout will be performed following the test.

J-2 ASI FAILURE

We received a call this morning from Jerry Thompson, R-P&VE-P, who is at Rocketdyne. Rocketdyne has not been able to simulate the failure as they expected. We have been asked to conduct a test on the J-2 combustion chamber stand at CTL. We will attempt to test this week.

NOTES 4/29/68 JOHNSON

1. OMSF Supporting Development Quarterly Review - This quarterly review was held at MSC on April 25. The principal purpose was to review work currently underway, under OMSF auspices, which contributes to capability to develop long duration space stations. The MSFC presentations by Mr. Hopson, P&VE, Mr. Gassoway, ASTR, and Mr. Miles, EO, were quite well done. Dr. Hall briefly developed FY 69 budget guidelines for the Centers. The planned figures, $32M total with $17+M to MSFC, remain unchanged. Some redirection of technical content to increase applied systems research is planned.

2. Clear Air Turbulence Research - Several months ago, Mr. Milton Huffaker, Aero, subsequent to some limited open atmosphere tests of a laser-doppler backscatter system which he had developed as wind tunnel instrumentation, proposed attempting to extend the range of the device to make it on airborne laser radar for CAT detection. The Center has obtained "moral support" in FY 68 from OART and fiscal support is planned for FY 69. The first meaningful field tests will be attempts to detect vortex disturbances created by jet aircraft during take-off and landing. A test program is being planned in cooperation with Langley to take place later this year. We will keep you informed on the results.

3. OART FY 70 Planning Cycle - On April 23 and 24, OART conducted a status review of their FY 70 planning in preparation for the Advanced Research and Technology Board Meeting sometime during the June 6-14 period. Center Directors will be invited to the two-day Board Meeting. Center representatives were invited to the April 23 meeting and to the critique on April 24. Messrs. Chase (MSFC representative on the Advanced Space Technology Working Group - AST/WG) and Miles, both of R-EO, attended these sessions. Generally, the aspects covered are the same as those being considered by the AST/WG. The planning reflects an optimistic funding picture with all major areas (e.g., Chemical Propulsion, Nuclear Rockets and Aeronautics) showing an increase. During May, all Centers will be visited by OART key personnel for working sessions intended to interject realism into the planning and to identify alternatives with sound answers to the questions: WHAT, WHY, WHO and FUNDING REQUIREMENTS. Guidelines for the working sessions are expected this week.

NOTES 4-29-68 KUERS

1. Status of S-II Mini-Stage: On Friday, April 19, at quitting time The Boeing Company reported a damaged area to the S-II Common Bulkhead of the Mini-Stage. Boeing personnel had been working inside the LH_2 tank on installation of wire harnesses for the strain gages for the three preceding days on a parttime basis while our personnel had been working outside on the spray foam insulation. The damage consists of two punctures of the face sheet about 1-1/2" in diameter with the honeycomb core also being damaged. A subsequent inspection by QUAL Lab revealed three additional dented areas. At the present time it is not known how and by whom the damage had occurred. Our personnel had also worked inside the tank before on the splice ring installation; but we had always used a heavy protection cover on the bulkhead while Boeing had only used a cardboard cover because they needed access to the bulkhead surface for installation of instrumentation. The repair of the damaged area is being discussed between P&VE, NAR, and ME. It will consist of adding doublers, connected by blind fasteners and bonding, over the damaged areas and sealing them by a membrane seal. It appears that the repairs can be accomplished without schedule impact.

2. Hydraulic Cylinder for KSC: The repaired cylinder and piston for the crawler have been delivered to KSC. We are still machining a second cylinder of the same type as a spare. But this work is, of course, of lower priority and is done without using overtime.

NOTES 4-29-68 LUCAS

1. POGO WORKING GROUP: Following the meeting of last Tuesday in which you participated, the POGO Working Group (Mr. E. A. Hellebrand, Chairman) was expanded to include Mr. Blackstone (ASTR); Mr. Lawrence, (COMP); Mr. Goetz (TEST): Mr. Crenshaw (IO); Mr. Kornell (Boeing/Michoud); Mr. McTigue (Boeing/TIE); Mr. Wade and Mr. Modlin (MSC): and Dr. Ed Larson (Rocketdyne) in addition to the members identified at the meeting. Dr. George W. Brooks of Langley Research Center will act as consultant. Analytical effort is proceeding rapidly and planning of a coordinated and extensive testing program is underway.

2. SERPENTUATOR - EVA TRANSLATION DEVICE: In a meeting with Bill Horton, ME and P&VE, the following agreements were made: (1) ME will design and develop a Neutral Buoyancy Serpentuator to prove the feasibility. We will provide human factors inputs. (2) P&VE will prepare the specifications and R&D plan for the flight type Serpentuator and the necessary test hardware. We will design the flight type hardware and perform the human factors analysis. (3) The Serpentuator will be provided as back-up to the present baseline manual translation devices for the primary and the contingency ATM mission modes.

3. LOCOMOTION AND RESTRAINT AID: We participated in a review and evaluation at Ames Research Center, of an astronaut mobility aid called, Locomotion and Restraint Aid (LARA), considered for possible application on the S-IVB Orbital Workshop (OWS). The device would give the OWS crew the capability to walk naturally in a zero-g environment. Messrs Vaccaro and Heckman tested the system in neutral buoyancy at Ames and found it to have practical applications for the OWS. Arrangements are being made to have the LARA test hardware shipped to MSFC for additional evaluation in the Neutral Buoyancy Simulator.

4. OMSF AD HOC EVA WORKING GROUP: The third meeting of the OMSF Ad Hoc EVA Working Group will be held at the Ames Research Center on April 30, and May 1, 1968. Presentations on ATM Film Retrieval Astronaut Translation Devices including the Serpentuator will be given by our representative.

5. PRATT AND WHITNEY WILL CLOSE LOCAL OFFICE: Pratt and Whitney Aircraft will close its Huntsville office early in June. This action, taken for economic reasons, is the result of a reduction in contracts with MSFC. This closing will cause some inconvenience on existing contracts and related technology.

6. AS-502 CAMERA RECOVERY STUDY: A study has been completed on the recovery of the cameras from the S-IC and S-II stages for the AS-502 flight. Results of the study revealed that both the S-II cameras were ejected upon command but only one S-IC camera ejected properly. The failure of the S-IC camera to eject is believed to be due to inadequate pressure in the GN_2 storage system.

NOTES MAUS 4/29/68

MSF INSTITUTIONAL AND TECHNICAL PLANNING

A meeting is scheduled at Marshall on May 1 and 2 with Jerry Kubat to review the results of MSFC, MSC and KSC's Institutional Baseline Cost Study.

The "Donlan Committee" also plans to meet at Marshall on May 2. This committee was formed to develop a planning mechanism to provide for a balanced and progressive level of technical activity at the MSF Centers. The purpose of the May 2 meeting is to prepare a first draft of a recommended planning mechanism and to plan for subsequent actions. The technical activities identified by this group would be considered as "add-on" to the minimum base defined in the Kubat exercise.

Both of these studies are in preparation for discussions at the Lake Logan meeting presently scheduled for May 24.

INTERACTION OF PLANNING STUDIES

The Institutional Baseline Study, the Special Launch Vehicle Study (under Milt Rosen for Dr. Newell), and the Apollo Cost Study Update have been initiated. Several elements of these three studies tend to overlap. In an effort to insure a consistent Center position between these studies, and also to minimize duplication, representatives from IO, R&DO and Executive Staff are currently analyzing the study guidelines and assumptions to identify the common portions. We will continue to coordinate this activity.

NOTES 4/29/68 RICHARD

Crew Safety Review Board: A tendency to prematurely direct the Crew Safety Review Board into problems being worked by line organizations threatened to extend the life of the Board to early summer. Two cases in point are: (1) the problem of spacecraft control of LV guidance in the event of platform failure, and (2) Saturn V propulsion oscillation resulting from LV/spacecraft structural system coupling. John Hodge, Board Chairman, argued for working these problems in the line and concluding the Board activity at an early date. General Phillips agreed. We plan to write the final report next week.

Deliberations so far have uncovered mostly procedural deficiencies, although final recommendations have not been drafted on the question of interlocking S-IB actuator null positions before commit.

Three presentations were made by MSFC personnel last week. Carlos Hagood, with CCSD and Boeing, presented space vehicle failure cases for the Saturn IB and Saturn V space vehicle, and a ground support equipment verification presentation was made by Mr. Robert Sparks of IO Saturn IB GSE Office in conjunction with Frank Henley of CCSD. The presentations were very well executed and very well received by the Board.

AAP CSM Modifications: We have been reviewing these modifications with NAR, MSC, and Headquarters. The contractor claims the costs originally quoted came from adding up a total shopping list provided and do not represent the actual expected cost. Dr. Mueller feels the remaining costs are still above our available funding and has sent them back to work the costs some more. We will give you a run-down on these mods in our next AAP Systems Review.

NOTES 4-29-68 RUDOLPH

1. AS-503 Launch Vehicle:

o On Saturday, 27 April 68, we were advised by MSF that the AS-503 launch vehicle would be manned and the launch would be scheduled this fall; however, we are still to retain the possibility of flying unmanned with Boiler Plate 30 spacecraft if required.

o On Sunday, 28 April 68, KSC destacked the IU and S-IVB Stages (these will be stored at KSC).

o The S-II-3 Stage is being destacked today, Monday, 29 April 68. The barge is at KSC, and the stage is scheduled to leave for MTF on Wednesday, 1 May 68. The cryogenic proof pressure test is tentatively scheduled for Thursday, 6 June 68.

2. Saturn V Semi-DCR:

o The MSFC action items from the Saturn V Semi-DCR (held on Sunday, 21 April 68) will be reviewed on Tuesday, 30 April 68, in the Saturn V Control Center.

o On Thursday, 2 May 68, Gen. Phillips will utilize the Boeing TIE tele-service facilities at KSC, MSFC (HIC Building), MSC, and NASA Headquarters in order to review the status of all the Semi-DCR action items.

3. S-IC-D (Dynamics Test) Stage: The stage is being shipped from Michoud and will be on-dock MSFC, Saturday, 4 May 68. The stage will be stored adjacent to the MSFC dynamic test tower in order to be available for additional dynamic/POGO testing when required.

4. S-II-5 Stage at MTF: The cryogenic proof pressure test was started Friday afternoon, 26 April 68, but was terminated approximately one hour later due to loss of electrical power at the A-1 test stand. The test has been rescheduled for Tuesday, 30 April 68.

NOTES - 4/29/68 - SPEER

1. MSFN STATUS: The Manned Space Flight Network (MSFN) in supporting the last three missions has not experienced any major problems in either software or hardware. The MSFN has met, and actually improved upon, their predicted schedules in preparing themselves to meet the Apollo schedule. GSFC has now committed the MSFN to support the Apollo program schedule and the schedule modifications made during the past week should make the situation even better for the network. The somewhat fictions but frequently quoted constraint of four months between the last unmanned and first manned missions is now officially dead.

2. BOOSTER SYSTEMS ENGINEER (BSE): Experience from the AS-501 and 502 missions has shown that we will continue to require three BSE positions in the Mission Control Center for Saturn V missions. The functions are as follows: BSE #1 - Team leader, monitors S-IC and S-II functions during boost and sends all commands to the vehicle; BSE #2 - monitors attitude control and all IU functions; BSE #3 - monitors S-IVB parameter during boost, orbital coast and second burn. Indications are that MSC will approve this request for AS-503.

3. HOSC POWER: Our efforts to make the HOSC facility independent of a single point electric power failure have reached the point that a formal proposal has been submitted to Dr. Mueller for final approval. I expect no problem.

4. AAP FLIGHT OPERATIONS PLANNING: In continuing to improve the AAP flight operations interface with MSC, MSFC representatives fully participated in MSC's Flight Operations Planning (FOP) Meeting of April 18 and 19. The prime item of discussion was the "AAP Baseline Reference Mission Document." This document had been the subject of much discussion between the FOP and the Mission Requirements Panel. An agreement has now been reached on the development of such a document and it is being jointly worked by MSFC and MSC and shows promise of being a very useful document. A preliminary issue of the document will be ready by mid-May.

NOTES 4-29-68 Stuhlinger

No submission this week.

NOTES 4/29/68 TEIR

SA-205 STATUS: Reference is made to my notes of 4/22/68 (copy attached) concerning spillage of N_2O_4 hypergol on Launch Complex 34 and the subsequent flushing which washed diluted HNO_3 into all three stages of the SA-205 launch vehicle. IU-205 was destacked on 4/26/68 and transported to the white room in the JPL hanger for continuation of inspection. Decision was made 4/26/68 to remove the forward skirt only from S-IVB stage, leaving S-IVB stacked. The decision was made after careful evaluation of procedures by the contractor and NASA to assure the operation can be accomplished without undue danger of damage to S-IVB stage and that upon reassembly, the stage could be adequately checked out and tested with KSC RCA-110 programs. The S-IVB forward skirt will be removed 4/30/68 for inspection. Tests are being run by P&VE and IBM to determine the effect of HNO_3 solution on the IU cable insulation and conductor. At this time it appears that we have no real concern on IU cables in that cables have been immersed in HNO_3 for periods of 24 hours and 48 hours thus far with no damage to either insulation or the conductor. At this time we plan to changeout only the 3 Apollo IU/SLA interface cables and a flight control computer cable, but investigation/inspection of the IU connectors is continuing and we may have to changeout additional ones. Based on the above information and with the thorough analysis/inspection now underway, we believe that we can establish full confidence in the flight worthiness of the IU. With the removal and replacement of one fin and the LOX bay access door, the S-IB stage should give us no problem.

An overall schedule assessment has not been completed by KSC but it appears that inspection of the S-IVB skirt will be pacing launch vehicle activities. We do not expect the launch vehicle to impact the launch schedule date; we are still ahead of the spacecraft schedule. I spent Saturday at KSC and inspected both the launch vehicle stack and IU. I do not feel we have a problem from a structure viewpoint. All surfaces exposed to the HNO_3 are being neutralized. Surveillance will continue in this area and periodic corrosion inspections will be conducted.

S-IB-11: The longduration static test of S-IB-11 was conducted on 4/23/68. All 8 bellows type seals have been inspected with no evidence of abnormal chipping or wear. The temperature probes installed in the LOX cavity drainline gave normal readings.

S-IB-12: This stage left Michoud 4/23/68 and is expected to arrive at MSFC 5/3/68. The long shipping time is due to the fact 3 barges are coming with one tug. The stage will be erected at Static Test 5/6/68.

NOTES 4/22/68 TEIR

SA-205 STATUS: S-IB-5 and S-IVB-205 were erected on April 15 and April 16 respectively. Due to high gusts of wind the IU and SLA were not erected until April 18.

We received word from KSC today that during a spacecraft facility hypergol flow test yesterday, a spillage of N_2O_4 hypergol on the outside of the Service Module/SLA area occurred. KSC hosed the area down with water and this flushing action caused some of the diluted fluid to enter the vehicle through openings in the SLA and vehicle skin. The extent of damage, if any, to the cabling and other launch vehicle hardware is not known at this time. We have asked P&VE to send some of their material personnel to KSC today to aid in the assessment of the damage. Our prime contractors will also be sending their material experts to KSC. We expect to receive a more complete assessment tomorrow morning.

OMSF MISSION DIRECTIVES: We have received word this week from Headquarters that Gen. Phillips has requested that his staff pull together the various details of the AS-205 mission and distribute them over his signature in the form of a mission directive. This directive will include considerably more detail than past mission directives in areas such as primary mission objectives, secondary mission objectives, abort and alternate missions, operational tests, and mission profiles. It is the intention of Headquarters that in the future the initial directive and subsequent revision will be issued six months and three months respectively prior to launch and that any of the items that the centers wanted to change that are contained in the directive will require Gen. Phillips' approval. We and MSC objected to this approach primarily because Headquarters is merely taking the center generated documentation and sending it back to us as Headquarters control information. This will work an undue hardship on the centers in trying to meet the mission planning dates for the various missions. From what we have been able to determine, the type of data that Headquarters intends to incorporate in the document usually changes during the final software generation cycle prior to launch. Headquarters buy-off on these changes could turn out to be disastrous to the schedules.

We understand that the centers will have an opportunity to comment on the directive prior to its issuance and I intend to make some specific recommendations on keeping it general enough so that we can meet operational flight requirements.

NOTES 4/29/68 WILLIAMS

1. CCSD "National Space Booster Study":

Representatives from ASO visited MSF-MTV last week (4-22/24) to discuss plans for this study. They sat in on MSF-CCSD negotiations on the work statement and contract. A 12-month study contract was signed on Friday, 4-26, ($995 K) and is scheduled to end April 23, 1969.

Dan Schnyer (Doug Lord's office) has been named to manage the study for MSF. MSFC representatives from both R&DO and IO will be named to work with him. Dan Schnyer is to meet with the NASA "study team", including other Center representatives, at MSFC on 4/30/68. An orientation meeting with CCSD is planned for the week of 5/6/68, probably at Michoud.